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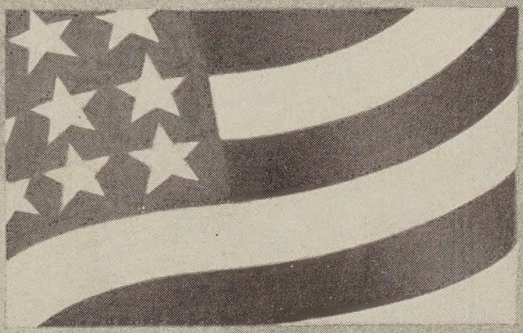

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SOIL CONSERVATION

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Control of the size of irrigation head permits adjustments for soil, slope, and cover conditions.

MORE FOOD FROM IMPROVED IRRIGATION

By D. A. WILLIAMS

IRRIGATION FARMERS from Mexico to Canada are concentrating on more food production: More than 150,000 farms with nearly eight and a half million acres under irrigation in Washington, Oregon, Idaho, California, and Nevada can produce more food and fiber. In the United States 90 percent of all sugar beets, 45 percent of all truck crops, 45 percent of all rice, and about 25 percent of all tomatoes are produced under irrigation. More than one-half the lambs fattened in the United States are on irrigated farms. About one-half of the irrigated lands produce one-half of all feed used in the livestock industry in the west. Produce more? Yes, every acre conscripted to its highest potential use and properly watered from the resource of available supply will produce more!

EDITOR'S NOTE.—The author is irrigation engineer, regional engineering division, Soil Conservation Service, Portland, Oreg.

Wide variations are found in the irrigation agriculture of the West, ranging from intensive cropping with nearly year-long irrigation seasons in the Imperial Valley of California to the occasional supplemental irrigations of the coastal and mountain areas of Washington. Crop adaptability is as varied as the soil and climatic conditions.

Availability of water is the limiting factor to increasing acres of irrigation agriculture in many parts of the West. There is generally more land capable of profitable production under irrigation than the water supply, under present use, will irrigate. One of the greatest opportunities for increasing production is through more efficient use of the water now available. From the watershed to the field, opportunities for conserving water are abundant. It has been estimated that for the 20,000,000 acres of crop and pasture land now irrigated in the United States, there is a 27-percent loss in conveying water to the

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land, and, after the water reaches the land, less than half of that water is effectively used. The place for solving the problem of water losses is, to a major extent, on the land where the water is applied.

Irrigation agriculture is just as dependent upon proper water use as it is upon proper land use to maintain a permanent agriculture. Water makes irrigation agriculture possible and man can generally control the water; therefore, he can have control over the agriculture.

MANY OF THE SOIL conservation districts formed in the Pacific coast region were established because farmers felt that their major land use problems were those of irrigation and drainage. Soil conservation districts are proving to be excellent organizations through which farmers and farmer groups can be brought together to solve mutual irrigation problems. There are more than a half million acres of irrigated land in 54 of the soil conservation districts of Pacific Coast Region 7—Washington, Idaho, Oregon, Nevada, and California.

Soil conservation districts in the West are attacking the difficulties of water use through cooperative action on community problems and by technical guidance to the individual farmers. Declining yields on irrigated acres result from several causes, mainly: infertility, erosion, alkali, water-logging, and weed infestation. District programs provide for correction or improvement of these conditions. Many solutions require group action and farmers are pooling their resources to rehabilitate ditches, put in drains, level the land, fight the weeds, and engage in numerous other activities that spell common success. Farmers are eagerly seeking technical guidance, not only in the improvement of the farm distribution systems, but also in adopting irrigation techniques which will improve the efficiency of water use.

THE USE OF CROPPING SYSTEMS to improve fertility makes possible a balance of high- and low-water requirement crops, thus extending the available water to the maximum acreage. The planning of cropping systems in accordance with the use capability of the land is often of even greater importance on irrigated lands than on nonirrigated lands, because of its direct correlation with efficient water use. In areas of the Pacific coast region where the water supply is from mountain streams, the supply diminishes during the irrigation season. To secure maximum use of the water, cropping systems can be planned which provide for decreasing water requirements as the season advances. A typical example is that of a farm in southeastern Idaho upon which the irrigated acreage was increased from 14 to 70 by taking advantage of the periodic water supply by months in planning the cropping program. Formerly the 14 acres had either received the total supply throughout the season or the excess water had been wasted. Early season cropping permitted beneficial use of all of the water and was also a benefit to the 14 acres which had previously been over-irrigated.

Essential to conservation planning of improved irrigation practices is guidance regarding the proper time, rate, and amount of water applications. Farmers need to know the approximate water-holding capacities of their soils and the water requirements of the crops grown, so that irrigation may be timed for crop needs and water applied in amounts that will replenish the root zone depth of the soil with moisture to field capacity. It is common for farmers to irrigate irrespective of differences in soil or crop type. On-site demonstrations of testing water penetration with a soil auger have been most helpful in pointing out penetration rates and proper amounts of application. Irrigation education is aiding progress in getting away from "calendar" frequency of application and in the adoption of "crop need" frequency in its stead.

CONTROL OF IRRIGATION WATER is the key to proper irrigation. To obtain control, the farm distribution system must be fitted to the soils and topography so that the methods of application particularly suited to the soils and crops, may be employed. The spacing of head ditches to define lengths of run, devices for adjusting heads of water, positive division of water to fields, land leveling consistent with suitable methods of application, and efficient transportation of water are all mechanical aids designed to improve water distribution and to control erosion.

These aids are not the end point, but rather the tools with which to achieve high efficiencies of soil and water use. A large percentage of all lands under irrigation are insufficiently leveled to permit efficient water distribution. In most instances only light leveling is required greatly to improve the fields. Operations in nearly all soil conservation districts of the Pacific coast region include this practice. Many districts are purchasing land-leveling equipment and in others the Soil Conservation Service is making such equipment available. The texture and depth of soil is carefully considered in recommending leveling. In those instances where the soil is shallow and the use of the land is restricted, the distribution system is laid out to secure maximum results with a minimum of soil disturbance.

The conservationist or engineer working with the farmer in improving the farm distribution system can render an important service by employing the use capability of the land so that the system will permit the proper irrigation of those crops which are best adapted to the site conditions. Once the distribution system is corrected, the technique of water application can be altered to meet crop and seasonal variations. Simple controls which require no strategic war materials can be employed as labor-saving devices.

MANY EXAMPLES could be cited to show that better irrigation means more production and less labor. A few typical cases will illustrate this point. The system of irrigation on a 100-acre sugar beet field in southern Idaho was revised to secure better water distribution. Lengths of run of the irrigation furrows were reduced from 1,200 feet to 400 feet, and simple control devices were installed. One less irrigator was required as a result of this revision and the yield of beets was increased from 12 to 17 tons field average.

Better distribution of water with no increase in labor for irrigating resulted in an increase of one-half ton of hay per acre on a 40-acre field in the Kittitas Soil Conservation District in Washington, when runs were reduced from 1,320 feet to 330 feet and corrugations were effectively spaced.

By planning a seasonal balance between crops and water, a Nevada farmer found he could increase the acreage actually irrigated during the summer months by 24 acres. These 24 acres would raise the additional feed required for his dairy herd at no sacrifice of the other crops because he was to use that water which he had been wasting!

Many farmers in water-shortage areas of California have installed overnight storage reservoirs to provide more effective heads of water resulting in increased production and reduced labor. Scores of farmers have improved upon the method of water application as a result of technical assistance, for example: On the 190-acre citrus grove of the El Rancho Grande in Los Angeles County, Calif., irrigation and cultivation costs were reduced 40 percent primarily by the adoption of the broad furrow method of irrigation. Yields and quality of fruit have, at the same time, been materially improved.

Many farmers, however, are in the position of not being able to improve greatly upon their farm irrigation because the source of the water is not dependable. Such was the case with farmers living along Powder River in the Keating Soil Conservation District in Oregon. The supply canals were continually

The canals of the Southside Improvement District were in a deplorable condition in March 1943.

Wartime assistance to farmer groups assures water delivery. Shovel working on rehabilitation of Southside Improvement District canal shown in previous picture.

Misuse of land by poor cropping practices and uncontrolled water causes erosion and poor yields.

Simple control devices such as this canvas ditch-check help to conserve water.

breaking during the 1942 irrigation season, jeopardizing the crops on much of the 4,200 acres of cropland. Naturally, the farm operators were not in a position to adopt improved cropping systems or better use of water until they could depend on water delivery. At the request of the soil conservation district supervisors, the Soil Conservation Service made a reconnaissance survey of the entire distribution system on the south side of the Powder River, and investigated the status of water rights, organizations, and other pertinent matters. It was discovered that the main problems of the community irrigation systems were organizational and physical. The lack of a responsible water users' organization, with the consequent lack of maintenance, had resulted in a critical situation. Three unincorporated ditch companies had been attempting to operate overlapping distribution systems, but no cash assessments were levied (or could be collected, if levied), and maintenance was dependent upon contributions of labor. As the years passed, the canals became less operative, until in 1942 approximately 1,000 acres were without sufficient water to produce good crops, and a similar additional acreage was damaged as the result of canal breaks.

In September 1942 a meeting was called of all water users, at which time the organizational problems and the physical condition of the distribution system were discussed. As a result of this meeting, under the leadership of the soil conservation district technicians, the former ditch companies were abandoned, and a single water users' organization was perfected. This organization, known as the Southside Improvement District, incorporated under the laws of the State of Oregon, now has legal status to construct, operate, and maintain the community distribution system. Following the process of organization, a plan of rehabilitation for the entire system was developed by the soil conservation district, and a working agreement was executed by the two farmer groups.

The improvement district made an emergency assessment and collected the funds with which to finance the immediate rehabilitation program Under terms of the working agreement, the soil conservation district loaned, on a rental basis, several pieces of equipment to the improvement district, and furnished, free of charge a dragline rented from a railroad company. The immediate rehabilitation program provided for the realignment of canal sections, removal of high spots and accumulated silt and debris, strengthening and sloping of canal banks, and otherwise revising the canal cross-sections to the required hydraulic characteristics. Approximately 6 miles of improvement with a half-yard shovel, and 22 miles with a bulldozer and grader, were required immediately. Farmer labor and all materials were furnished by the improvement district.

Construction was started in March of this year, and a dependable supply of water was delivered by May 15. Following the 1943 irrigation season, the Southside Improvement District will continue the rehabilitation program. Specific maintenance provisions have been adopted which should provide for the continued functioning of this enterprise. As a result of this program, the farmers can produce at least 3,000 tons of alfalfa, or its equivalent, in 1943, which would not have been possible otherwise.

Additional increases in production will result as the farm operators adjust their cropping programs and practices to use the soil and water in the wartime service for which it is selected.

HUNDREDS of situations, similar in many respects to the example given above, may be found in the west. Education, organization, community action, and technical guidance available through soil conservation districts can work wonders for farmer groups as well as individuals. Conservation can be the irrigation farmers' solution to more production from every acre and every gallon of water!

Since the meeting of the Eighth Scientific Congress there has developed for the first time a consciousness in each of the South American countries that the problem of conservation is actually a continental problem. They are aware of the valuable lessons that they can obtain from the experience of the United States in its soil conservation program. Without doubt, the field of conservation is going to be one of the most vital fields for inter-American collaboration in the future.

The basis of this collaboration has been laid by the formation of the Pan American Soil Conservation Commission. The first meeting of the organization was held at the Pan American Union in Washington on September 3, 1942. At this meeting the delegates of the member countries elected Dr. Bennett chairman of the Commission, and empowered him to formulate, with the assistance of a small executive committee, a program of action. It is anticipated that this program will be an important segment of the total program of inter-American cooperation.—Ernest E. Maes, Secretary, The National Indian Institute.

Before this farm drainage ditch was dug in February 1943 on the John Yarmon farm in the Delta demonstration project, this land was frequently idle because of ponding.

DRAINAGE PUTS FERTILE DELTA LANDS TO WORK

By H. G. EDWARDS

POTENTIALLY FERTILE but poorly drained croplands assume increased importance in time of war. Such areas represent a large proportion of the good land available for expansion of farming operations.

Of the nine States in the Southeastern Region, Mississippi furnishes perhaps the outstanding example of what can be done by drainage to utilize fertile but idling lands. This State has approximately 2,778,000 acres requiring proper drainage for adequate crop production.

Drainage work is not new in Mississippi, the first drainage district having been organized under a law enacted in 1886. Nor is the upsurge of interest in drainage work during wartime limited to the present conflict. In the period of high agricultural prices after the first World War, organization of drainage districts and drainage operations boomed. With low farm prices later, much of the drainage work was allowed to deteriorate.

Although some 3,100,000 acres, or more than 10 percent of the total area of Mississippi in 1940 was assessed in organized drainage districts, most of the districts, like Topsy, just grew without any over-all program for coordinating the work. In the hill section of the State, as many as five or six districts would organize along one short stream. A district would be formed along the upper reaches of the stream and a ditch dug for a few miles. This ditch would concentrate water on lower areas and, as a result, another district would be organized and the ditch extended a few miles farther. This would be repeated several times. Frequently sand and silt washed from eroded hillsides would clog the ditches. Because of the lack of a coordinated program on a watershed basis, and the isolated nature of such developments, the damage to other lands was often considerable. Maintenance was woefully neglected.

Today the drainage program in Mississippi is being approached along sounder lines. Working through soil conservation districts, which provide a mechanism for coordinating activities, the Soil Conservation Service is providing technical assistance in the rehabilitation of existing drainage facilities, and is assisting other landowners in developing and maintaining community drainage projects.

Probably the most significant feature of the new program is the simultaneous attack on the drainage problem at both ends of the line. In the past, development of drainage consisted in providing the main drainage canals and lateral ditches, without any attempt to solve the drainage problem on individual

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farms. In soil conservation districts, development of an individual farm drainage plan becomes a consideration in developing the conservation plan. The development of complete conservation programs on the farms of the watershed provides a means of controlling erosion before the silt and sand washed from cultivated fields have contributed to the deterioration of the outlet system and created a serious maintenance problem.

The development of adequate drainage facilities, in conjunction with the conservation program on the land, is making available lowland areas for row crop production. This enables farmers to devote to perennial vegetation and other close-growing crops the steeper, more erodible areas, which in the past have been the source of most of the erosion debris which has clogged drainage channels. The steeper areas thus can be used for production of hay and supplemental grazing crops needed for increased production of milk and meat. This reflects sound land use, the fundamental basis of the soil conservation district program, and indicates the close affinity between conservation and drainage operations.

The first drainage work undertaken by the Soil Conservation Service anywhere in the Southeastern Region was in Coahoma County, in the Yazoo-Mississippi Delta. A CCC camp assigned to the Service was set up, with headquarters at Clarksdale, in April 1940, for rehabilitation of the primary drains in Coahoma and parts of surrounding counties. The work was limited to cooperation with legally organized drainage districts, and included repair, renovation, relocation, or reconstruction of existing drainage facilities.

Operations continued for a period of a little over 2 years, until all CCC camps were abolished on June 30, 1942. During the 2-year period, enrollees of the camp, under supervision of Soil Conservation Service technicians, rehabilitated 43⅓ miles of canals, including clearing, channel excavation, spoil bank leveling, establishment of permanent vegetation on ditch banks and slopes, and construction of adequate surface-water inlets for field drainage. The work benefited some 66,000 acres in Fishing Bayou, Hopson Bayou, New Africa, Sevier Lake, and Bush Outlet drainage districts, and Hopson Bayou subdistricts No. 1 and No. 2.

In May 1942, just prior to the conclusion of the camp operations, a 52,480-acre demonstration project of the Soil Conservation Service was set up in Coahoma and Quitman Counties, with headquarters at Clarksdale, to develop and demonstrate proper land use, adequate farm water disposal systems, erosion-control treatments, contour tillage, and other related soil-conserving practices adapted to the Delta. Work on privately owned farms within the demonstration area was limited to 10,000 acres.

Benefitting from good major drainage ways provided by the CCC camp work, the project is demonstrating the broader phases of conservation, including the development of farm drainage systems and conservation practices which will control erosion and prevent silting of major canals.

The organization of soil conversation districts in Mississippi has provided a means of extending drainage work of the Service to other areas of the State, both inside and outside of organized drainage districts. The 2,788,000 acres in Mississippi requiring drainage for adequate crop production, include 1,780,000 acres in organized drainage districts and 1,008,000 acres outside of drainage districts that can be drained at reasonable cost.

One of the most extensive drainage problems outside the Delta is in the Little Tallahatchie River watershed, comprising 1,560 square miles, which is coextensive with the Tallahatchie River soil conservation district. This area comprises some 700,000 acres of land in farms, in addition to extensive areas of Federal and State land. Private land under cultivation includes 128,000 acres of upland, and 122,000 acres of bottomland. Bottomland requiring drainage totals 102,322 acres.

This area presents an extreme example of the relationship between drainage and erosion control in the watershed. The history of the area is similar to that of many other areas in Mississippi and other parts of the South, except that conditions are more acute. The Tallahatchie River drainage district and a number of smaller drainage districts in the watershed were organized about 30 years ago, and much bottomland was brought under cultivation, but erosion debris has filled many of the drainage channels, and drainage is now poor. In many instances, farmers are being driven off their bottom-

Severely eroded areas of hill land, as seen in this aerial view, contribute sand and silt which clog drainage channels on lowlands. Development of adequate conservation program is an essential part of sound drainage strategy.

land and forced to farm steep, eroding lands which should be in permanent vegetation.

Preliminary drainage surveys and cost estimates have been made by the Soil Conservation Service in 22 organized drainage districts in the Tallahatchie River soil conservation district. Land-use capability classifications, flood and erosion control requirements have been evaluated in the United States Department of Agriculture's flood-control survey report on the Little Tallahatchie River.

Indicative of the local interest in drainage work in the Tallahatchie River soil conservation district, a group of farmers on Tippah Creek, in Tippah and Benton Counties, on their own initiative, secured a dragline and began operations as soon as the Soil Conservation Service began laying out the ditches. Work already completed has benefited 568 acres on 17 farms.

Approximately 8 miles of ditches are contemplated on this community project. By the time 5 miles of ditches had been laid out in Benton County, the dragline had completed work on the first 3 miles.

A more extensive community project in the Tallahatchie River soil conservation district is being developed by a larger group of interested landowners organized as the Upper Tallahatchie Citizens Soil Conservation Committee. This group plans drainage and other conservation operations on the Tallahatchie River in the vicinity of New Albany in Union, and parts of Tippah and Pontotoc Counties. This program is being pushed in cooperation with the soil conservation district.

In the Madison County soil conservation district a group of 13 landowners on Love Creek, with the assistance of the soil conservation district supervisors, obtained the use of a dragline which at the time was idle in Florida. At a cost of $4,100 they completed a canal draining 16.5 square miles of land which last December successfully handled a rain of 8 inches in 24 hours. The canal directly benefits 850 acres.

"My land is down near the mouth of the creek and I use this land principally for pasture, corn, and cotton," reports John H. Whitworth, a commissioner of the soil conservation district. "At one time I didn't consider this land safe for early crops,

W. J. Waites takes a look at this vetch growing on his farm in the Holmes County Soil Conservation District. Mr. Waites has terraced all the cropland on his 1,000-acre farm, and has constructed adequate outlets to care for all the water from his fields.

but now I can go ahead with my farming operations early. Of course, the canal is new and we haven't had figures to prove anything yet, but I have been able to increase production of both crops and cattle as a result of the canal."

John S. Garland, another member of the group, says that on 20 acres of land that used to be too wet

Hereford cattle grazing on former marshland on farm of Dr. Gus Parr, Union County. After drainage, the 40 acres were seeded to white Dutch clover, Dallis and Bermuda grass, and lespedeza, providing good grazing for 30 head of cattle.

for corn, he made 40 bushels of corn to the acre last year. "I intend moving my pasture to the hill land and farming these bottomlands now," he adds.

A considerable amount of other drainage work has been done in Madison County, using a crawler type tractor and blade for construction. On the farms of Dr. W. B. Smith and H. H. Miller 1,600 acres have been benefited by two 3,000-foot ditches.

Four farmers along the west fork of Lewis Creek in Montgomery County have brought several hundred acres of fertile bottomland on their farms into production during the past 2 years through a community drainage program worked out with assistance of the Montgomery County soil conservation district.

Their problem involved the enlargement and realignment of the small creek, construction of adequate drainage ditches on individual farms, terracing of slopes bordering the bottomland, and construction of terrace outlet channels to control run-off water.

H. L. Nichols, Montgomery County Soil Conservation District, expected to make 80 bushels of oats to the acre this year along this drainage ditch. District Conservationist L. A. Wilkins is examining the grain.

After a plan for carrying out these operations had been developed by the Soil Conservation Service, through the soil conservation district, the actual work was done by the farmers. These farmers co-operated in the use of a tractor and bulldozer rented

to carry out the heavier operations provided for in the community drainage plan for the four adjoining farms.

When work was begun on the B. Hester farm in the spring of 1941, water was flooding approximately 100 acres of the best bottomland with nearly every rain, J. W. Mann, tenant on the farm, reported. In 1939 15 acres of corn in the bottom produced 10 bushels per acre, and in 1940 16 acres were drowned out.

Proper sloping of banks on this drainage ditch is enabling King Callicutt, Union County farmer seen at the right, to plant every foot of this fertile lowland area to corn.

Even poorer results were obtained with cotton before the land was drained. Thirteen acres of cotton planted in 1939 produced only 2 bales and

This Negro family is living in what was formerly the loft of this tenant house. The house was partially buried when silt-clogged Abiaca Creek burst its banks and poured sand and other erosion debris over the surrounding lands.

Main drainage canal of Tippah River Drainage District No. 1 in the Tallahatchie River Soil Conservation District. The canal was cleared out in the fall of 1942 at a cost of $100 a mile.

Mr. Mann didn't even attempt a picking on 11 acres planted in 1940.

In 1941, immediately following the completion of the community drainage program, this farmer averaged 61 bushels of corn per acre on 30 acres in the bottom, with some of the land producing as

Plan Simpson, farmer, left, and W. L. Heard, Tallahatchie River district conservationist, inspect newly excavated farm lateral benefiting 150 acres on 5 farms in Tippah drainage district. Spoil bank at left will be levelled.

high as 80 bushels per acre. He got 19 bales of cotton on 22 acres.

In 1942 his corn yield was reduced to an average of 40 bushels to the acre, owing to the lack of nitrate of soda; even so, this was four times the 1939 yield, when plenty of soda was available.

Following drainage, 3 acres of bottomland in lespedeza and native grasses yielded 229 bales of hay,

weighing approximately 75 pounds each. The hay land was treated with a ton of lime and 333 pounds of superphosphate per acre.

"The draining of this bottomland will enable me to retire all of my rolling land to pasture and perennial legumes as fast as labor will permit," Mr. Mann said. "I consider the work done has increased the returns from this farm at least $600 a year, or the amount that I am paying for rent."

Henry V. Kent estimates that $165 expended for use of a tractor and bulldozer in carrying out the drainage plan on about 100 acres of affected land on his farm will be worth at least $500 a year. It enabled him to increase his corn production from 500 to 1,500 bushels and to convert to pasture 20 acres of land formerly used for row crops.

With the same equipment used by Mr. Kent, G. W. Suggett constructed a little more than a quarter of a mile of ditching on his farm at a cost of $70. He reports that his corn yields have more than doubled during the past 2 years and estimates that the drainage work will be worth at least $200 a year to him in increased crop yields.

T. W. Patterson, who had approximately 150 acres of bottomland on the west fork of Lewis Creek, reports that it was necessary for him to spend only $25 for work with the tractor and bulldozer and that the rest of it was done with mules and slip scrapes.

"I got at least $1,000 more for my crops in 1942 than I would have gotten otherwise," Mr. Patterson said.

A conservation survey of an area in need of drainage is a very important operation in the study of the problem. The Soil Conservation Service is now making a detailed conservation survey of Union County, which lies almost wholly within the Tallahatchie River Soil Conservation District, and of Tippah County, about half of which is in the district. A detailed reconnaissance survey is being made of Pontotoc County, which lies partially in the Tallahatchie River district.

The Yazoo-Mississippi Delta area where the first drainage operations of the Service were undertaken comprises approximately 4.2 million acres in northwest Mississippi. It includes all of 10 counties and parts of 9 others. The area is protected from direct floods from the Mississippi River by large levees that extend from the bluffs 20 miles south of Memphis, Tenn., to a point near the outlet of the Yazoo River, approximately 10 miles north of Vicksburg.

Before the AAA program went into effect, approximately 78 percent of the cropland was in cotton. As a result of this program, the cotton acreage was cut approximately in half. The proper treatment and utilization of the land removed from cotton production has constituted a major challenge.

Recently, corn, oats, soybeans, sorghum, rye, wheat, barley, alfalfa, and many other crops have been tried with marked success. Some areas have been made into permanent pasture. A great many grasses and legumes offer considerable promise. These include white Dutch, hop, red, and Persian clovers, along with several other species of native grasses and clovers.

The war demand for long staple cotton has emphasized the production of this type of fiber, which is especially adapted to Delta conditions. Improved cropping practices have increased acre yields and improvement of drainage facilities has reduced the hazard of crop losses.

The general conception of the Delta as a very fertile, flat valley floor with no particular soil and water problems, is only half the true picture. An erosion problem second only to the drainage problem exists on the "A" slopes, and these problems are inseparable. At points where farm drains empty into public drainage canals, silt bars often form as a result of soil erosion. The gradient of the canals is necessarily low, due to the topography of the land, and even small silt bars back water for several miles in the main canals. Many acres of fertile farm land are flooded as a result of backwater which will not allow the outlets from farm drains to function properly. These silt bars soon become thickly vegetated with willows and other undesirable plants.

Farmers in the Delta are rapidly coming to realize the value of proper drainage on individual farms in conjunction with sound conservation practices to control soil losses on cropland. They are finding that many areas heretofore not considered safe for crop production are being freed to do their part in the war program. E. F. Whittington, of Clarksdale, commissioner of the New Africa drainage district,

and a cooperator in the Delta demonstration project, expresses this point of view in regard to his own farm and nearby properties.

"As a result of drainage, the farmers are able to raise more feed and food than ever before, which is enabling them to meet the present demands," he declares. "Draining on my farm has been very effective, as far as it has gone, and I hope that we can complete drainage of my entire farm in the near future. These ditches are enabling me to use every acre of land and are absolutely essential for the production of crops on the heavy Delta soils.

"Clearing of undesirable vegetation from the canals and spreading and shaping of the canal banks has cut the maintenance costs to a minimum. Where drainage canals empty into rivers and bayous, these outlets have been protected with vegetation and are proving to be most successful and beneficial."

The cumulative value of acreages brought into production on many farms is indicated by L. J. Barksdale, another Delta demonstration project cooperator, who has brought into cultivation two fields, 40 and 60 acres in size, which were not considered safe for cultivation until improved drainage facilities were established.

"I'm not afraid to plant these two fields now, for water that used to give me fits can get off my land and into the canal and not hurt me," he explains. "With the need for more feed and food, these acres added to safe cultivation help me to raise more of what is badly needed now. I can count on every acre every year."

The preliminary work that was begun in the Delta by the CCC camp and is being rounded out by complete conservation programs on cooperating farms has been extended to other sections of the Delta through the soil conservation district program.

Excellent results, for example, have been obtained from a drainage terrace system on the J. H. Thomas farm, in the Holmes County soil conservation district. Five hundred acres on the Thomas farm have been drained and crop production has been made more uniform and materially increased.

District equipment has been used in the construction of V-type ditches on the Hugh Nichols farm, where 32 miles of ditches have been cut in draining 800 acres of "A" slope land An additional 200 acres is to be drained by drainage terrace construction.

On the 1,809 acres he is now working, Nichols used to have 200 acres of wet land planted in corn, oats, and soybeans "mainly to improve the looks of my farm." These were some of the most fertile acres on his farm, but they produced crops only during dry years—that was before Nichols constructed the first 26 miles of open ditches during the winter and spring of 1941, with district equipment, at a cost of approximately $700.

Before drainage Nichols produced 8 bushels of corn to the acre on this land; after drainage he produced 40 bushels. His per-acre yields of oats increased from 15 to 50 bushels. "The increased crops more than paid for the drainage construction the first year," he says. "The work has enabled me to get at least $5 an acre more for my crops, or $1,000 a year on the 200 acres affected by the drains."

The district equipment is now working on the Louis Lowentritt farm, where 58 miles of ditches are being cut and 2,000 acres, including 700 acres to be terraced, are to be drained.

To summarize drainage problems in the southeastern region—Many mistakes have stemmed from disregard for soil capabilities, and from failure to provide adequate drainage plans for individual farms. Detailed conservation and drainage surveys provide a sound basis for the development of wet lands. In numerous instances in the past, mistakes have involved inadequate outlet facilities, poorly designed or constructed systems, lack of maintenance, and the failure to control erosion on adjacent slopes. In many agricultural communities, farm drainage has been inadequate or impossible because of the failure to develop or improve outlet facilities by either private or public enterprise.

The Soil Conservation Service has established in the southeastern region a method for evaluating the many factors that enter into the problem of drainage in relation to land use capabilities when watershed problems are involved. A regional committee has been set up for the purpose of investigating and passing on the merits of proposed undertakings. The first step is a reconnaissance of the area by a group of technicians, consisting usually of an engineer, a soils technician, and an agronomist. If drainage appears feasible and essential to the estab-

lishment of improved land use practices, a soil conservation survey is made, land use capabilities are determined, the economics of the problem are considered fully, and the justification for drainage improvement is established. By this means it is possible to determine the requirements necessary to establish the degree of drainage needed in all parts of the watershed. Critical areas that may require intensive soil conservation treatment against destructive erosion detrimental to the land within the area and to the contemplated drainage improvements are likewise determined.

The drainage survey, plan, and estimate of cost are then made. This plan, which takes into consideration the economics of the problem, is then coordinated with the rest of the farm conservation plans within the area. This makes it possible to plan an adequate drainage outlet system that will permit the design and establishment of supplemental drainage facilities and desirable land use practices on all of the farms in the community.

Simple drainage problems such as are found on one or more adjoining farms usually are solved, following a general conservation survey, by the local work unit technicians with the assistance of specialists from the regional office of the Soil Conservation Service.

Whatever part drainage development may be called upon to play in bringing into productive use fertile lowland areas—enabling the country to muster into war service vast new farmlands without resort to another "plow up"—the groundwork has been laid, and well laid, not only in Mississippi but also in many other States.

MANUFACTURING NITROGEN RIGHT IN THE ORCHARD

By JOHN T. BREGGER

IN THESE WAR DAYS of chemical shortages, it is important for farmers and orchardists to grow as much as possible of their nitrogen supply. The fruit grower, who often relies upon nitrogen from a purchased source in higher proportions than any other single fertilizing element, finds it imperative to make use of all the natural sources. The winter crop, when it is a strong growing legume, gives him this opportunity.

While the "winter cover crop" is often a misnomer, inasmuch as it does not always give winter protection from erosion, it may redeem itself to a large degree through spring growth, and perform as a valiant soil-builder at that time. When growing conditions in the fall are favorable, however, the fall and spring growth combine to furnish yields of organic material which constitutes a genuine fertilizing asset. As a source of new nitrogen this is significant enough, but one can also count as gain the leachable nitrates which are held and returned to the soil. In this realm, even the nonlegume can perform an important function.

The August 1942 to May 1943 period has been one of the most ideal winter cover-crop seasons in the agricultural history of the Southeast. One leading agronomist has said that it has been the best winter cover-crop year since 1929. From the standpoint of present agricultural needs, the benefits derived have been enormous.

At the Orchard Erosion Investigations project having headquarters at Clemson, S. C., a comparison of promising winter and summer legumes has been made during the past 4 years. While much of this study has dealt with the soil and moisture conservation aspects of such cover crops, as affected by the various orchard soil-management practices, the soil-building factor has not been overlooked. Since the current season has been so ideal for the growth of winter species, a measure of the nitrogen added to the soil by utilizing such crops as plant food has been determined. Based on measured yields taken on representative areas of 4 square feet, computations were made of green-weight tonnage (whole plants) on an acreage basis, with adjustment for areas (about 20 percent) occupied by the orchard trees. Conversion to actual

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Editor's Note.—The author is project supervisor, Orchard Erosion Investigations, Soil Conservation Service, Clemson, S. C.

Stubble mulch following spring tillage of cover crop in experimental peach orchard.

nitrogen and sodium nitrate equivalent were then made, using standard and laboratory-determined percentages. The data is summarized in the accompanying table.

From this data, it is evident that large quantities of nitrogen are added to the soil when a good growth of legume cover crop is incorporated. From experiment station reports it may be expected that an acre of hairy vetch will take on the average as much as 100 pounds of nitrogen from the air. If it is assumed that only half of this total amount will immediately become available to the trees, even that is equal to 50 pounds of nitrogen added as a commercial fertilizer, or 300 pounds of nitrate of soda.

The fertilizing value of a leguminous cover crop in terms of artificial fertilizers has long been emphasized. According to Bureau of Plant Industry workers, hairy vetch has been known to add as high as 202 pounds of pure nitrogen per acre. This is well over the amount supplied by a half-ton of sodium nitrate. When field crops follow such a legume, yields are often just as high as when additional nitrate of soda is also added. In fact, it has been demonstrated that where corn followed a good stand of Austrian winter peas, the additional application of sodium nitrate did not increase the corn yield a single bushel.

While a nonlegume cover crop will not add new nitrogen, its increased use, especially in mixtures, is to be encouraged for several reasons. In the first place it not only provides increased tonnage by its

Orchard Cover Crops—1943

Species or mixture	Green matter per acre in tons[1]	Computed pounds nitrogen per acre[2]	Equivalent in pounds $NaNO^3$
Green Stage (April 3)			
Rye	9. 8	90	564
Rye, Austrian winter peas, vetch	15. 3	252	1, 575
Rye grass and crimson clover	13. 9	89	557
Austrian winter peas	12. 3	143	892
Hairy vetch	9. 8	132	824
Crimson clover	14. 2	136	850
Button clover	15. 3	151	945
Southern spotted bur clover	7. 1	116	728
Blooming Stage (April 29)			
Button clover	19. 1	230	1, 440
Southern spotted bur clover	8. 7	143	892

[1] Based on 80 percent coverage (orchard conditions).
[2] Based in most cases on analyses in Morrison's "Feeds and Feeding" (Last Edition).

own weight, but it affords support to the legume plants so that they, too, will make more growth as a result of more efficient exposure to sunshine. Of equal importance is the carbonaceous material supplied by a nonlegume, which prolongs the period of decay, thus making a large supply of the nitrogen available over a longer period of time. Winter erosion losses are cut down as a result of increased ground cover, and subsequent summer erosion is reduced through formation of a fibrous root system. In addition, a good mulch residue is provided. A single rain can remove as much nitrogen and organic matter as the amount added to the soil by a good cover crop; this would seem to put high value on the nitrogen held in the organic material of a good growth of nonlegume plants.

Harvesting the winter cover crop for the benefit of an orchard is not the same kind of proposition that faces a general farmer when he turns under such a crop for the benefit of the crop which follows a few weeks later. In an orchard the cover crop occupies the land up to or during the very time fruit trees need their maximum supply of plant food. This creates a problem in timing the cultivation, and also dictates the method of tillage. If, for instance, an over matured nonlegume is involved, the orthodox type of "turning under" will often bring about nitrogen starvation in the trees. Thus, a "trashy" type of cultivation now called "plant mulch tillage" takes an important role in the orchard soil management program.

In evaluating a winter legume cover crop for orchard use, there are several factors to consider. Not only is yield or tonnage an important item, but also the period in the spring when the plants reach maturity. While larger cover crop yields could be produced, especially in a young orchard, if spring cultivation were to be delayed, this is not always in keeping with recommended practices. In the table shown here bur, button, and crimson clovers made fairly close approaches to maximum yields at the earlier cultivation date. Southern spotted bur clover, near the northern end of its growing range, gave the lowest relative yield.

While it is rarely possible to leave a cover crop to complete its growth without sacrificing tree growth and fruit production, there are modifications and exceptions to this general rule. The most important modification consists of practicing alternate middle or strip cultivation: This allows the cover crop to complete its growth and produce seed on a portion of the orchard area. During spring seasons of above-average rainfall the cover crop may also be left for a longer period, provided sufficient extra nitrogen is supplied to prevent a shortage for the fruit trees. Moreover, as in the case of an early-maturing legume species such as spotted bur clover, the danger from leaving the stand uncultivated is further minimized.

NEW CONSTRUCTION PRINCIPLES FOR FARM FISH PONDS

By VERNE E. DAVISON AND JOHN R. CARREKER

FARM FISH PONDS are becoming increasingly popular. On many farms, sites are available where the development of such a pond represents the best use of the land. Ordinarily fish can be caught from properly constructed and stocked ponds within a year, and the ponds provide a source of both pleasure and food for the farmer, his wife, and children.

Hundreds of ponds are being built for stock watering as livestock farming increases in the Southeast. Fish can be produced in these ponds as a byproduct if a little attention is given to improved features of construction.

New construction features designed to increase fish yield, reduce cost of maintenance, and lengthen the life of ponds, have been developed recently at the Southern Piedmont Experiment Station at Watkinsville, Ga.

Most important of these is the reduction of shallow-water areas in the upper reaches of impounded ponds. Although deepening near the dam to obtain soil for construction has been a common practice, the remaining areas of shallow water, formerly believed desirable, have been given little attention.

The fact is now well established that waters less than 2 feet deep are of little or no value for fish, but present, on the other hand, several problems of maintenance. Work at the Southern Piedmont Station has developed a simple method of reducing the amount of shallow water.

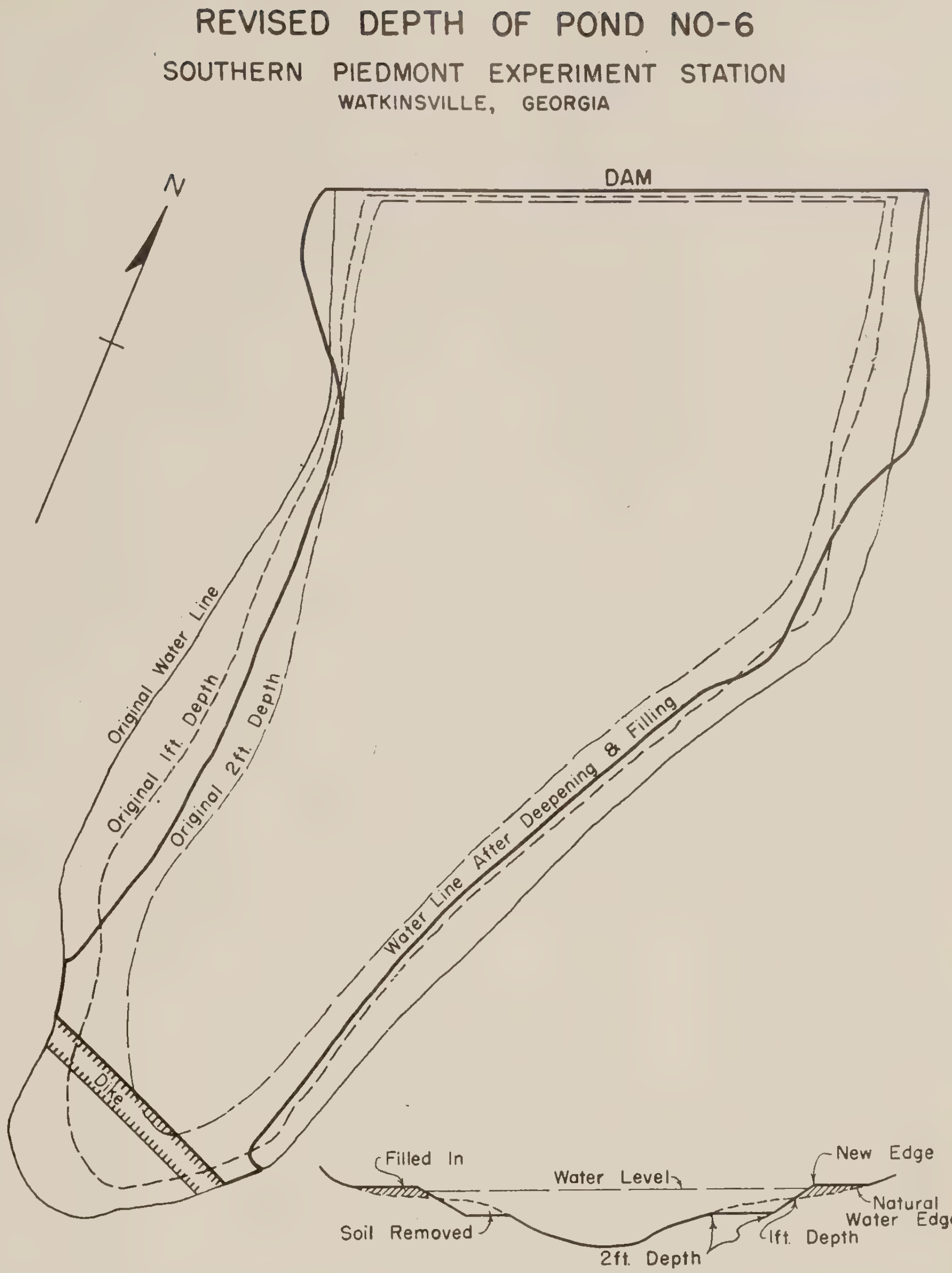
The second principle of better pond construction involves the use of a drain pipe through the bottom of the dam as a trickle spillway. This is inexpensive, and safer that the vegetative spillway, which sometimes fails, owing to saturation by continual overflow.

EDITOR'S NOTE.—The authors are chief, regional biology division, Soil Conservation Service, Spartanburg, S. C., and associate agricultural engineer, Southern Piedmont Conservation Experiment Station, Watkinsville, Ga., respectively.

The objectives of deepening the edges of a pond are (1) to control water weeds, mosquitoes, and the number of small fish more effectively, (2) to reduce the area of evaporation, (3) to prevent unnecessary muddying and destruction of spawning beds by livestock, and (4) to increase the areas of good fishing from the banks. Weeds that grow at the edge can then be reached and easily removed. Mosquito larvae can be controlled by fish. Bass are better able to feed on small fish, reducing their numbers so that a higher percentage of the total weight of fish in the pond is of usable size. The entire edge becomes suitable for both bream and bass fishing after deepening, whereas ordinary construction leaves only the end near the dam favorable to fishing. The surface area is reduced by the deepening process, and evaporation is limited proportionately, yet waters productive of fish are increased.

Deepening is done by filling in the edge where water is to be less than 1 foot deep with soil removed from adjacent areas which would otherwise be only 1 to 2 feet deep. To accomplish this operation, three contours are staked, one at the natural water level, a second at the 1-foot depth, and the third at the 2-foot depth. The strip between the 1- and 2-foot depths is then plowed and the soil scooped from it and moved to the shallower section. This brings the new edge to approximately the 1-foot line, but need not be exactly so. Smooth-curving lines should be left for pleasing appearance.

Diking off the shallow water at the upper end of a pond, rather than filling, is more satisfactory for a very gentle slope like that usually encountered at the shallow upper end. The dike must be raised a foot or so above the normal water level so that runoff water will enter the pond around both ends. Soil for the dike is taken from the pond basin just below it, further deepening it.



This sketch shows how to reduce evaporation, avoid maintenance troubles, and increase fish production by reshaping the shallow edges of a pond.

The accompanying drawing of Pond No. 6 at the Watkinsville, Ga., station shows how the areas of shallow water may be reduced. Without alteration the surface area would have been 1.63 acres, ranging in depth from 0 to 10 feet. The relation of shallow areas to the whole pond would have been as follows:

1.14 acre (70 percent)—2 feet or deeper.
0.23 acre (14 percent)—1 to 2 feet deep.
0.26 acre (16 percent)—Less than 1 foot deep.

The 30 percent of pond area less than 2 feet deep is undesirable. Thus only 70 percent would have been good. As a result of deepening, filling, and diking the following changes are effected:

1.37 acres (a reduction of 16 percent), surface area.
1.25 acres (91 percent) 2 feet or deeper.
0.12 acre (9 percent) less than 2 feet deep.

No material change was made in the acre-feet of

water. The 9 percent is the narrow area in the 2½ to 1 bank slope around the entire pond. Experience may show that a 3-foot depth is feasible for dry-land ponds to avoid extreme fluctuations in the size of the surface area due to evaporation.

The use of a drain pipe as a trickle spillway is accomplished by connecting it to a tipping pipe or a stand pipe that is brought to the pond surface elevation. Vegetated spillways are most economical for farm ponds but, as has been pointed out, they sometimes fail due to the constant saturation of the spillway by continual even though small overflows. By cutting the stand pipe off 4 to 6 inches below the spillway level, all of the normal flow and most of the runoff water that enters the pond is carried through the drain pipe, thus permitting the use of these inexpensive spillways.

EDITOR'S NOTE.—A new Farmers' Bulletin, "Fish for Food From Farm Ponds," discusses these two features of construction as well as other important steps in selecting sites, building dams, protecting against erosion, stocking properly, and managing wisely.

PASTURE FARMING MAKES 265 POUNDS BEEF PER ACRE

By DWIGHT D. SMITH

CUTTING THE LABOR COST to less than one-eighth, bringing erosion down to one-third or less, selling less of the soil fertility off the farm in the crop, yet producing more per acre, is essentially what is being accomplished by the soil-conserving pasture system of farming.

An average of 265 pounds of beef per acre was produced per season on the wheat-lespedeza grazing areas at the cooperative Soil Conservation Experiment Farm at McCredie, Mo., where measurements of erosion from pasture systems of farming are being made. This has been the top producing system of the five which are being studied. The equivalent in corn production of the 265 pounds of beef is 41 bushels per acre. This is more than the average corn yield in the corn-oats rotation. It is the highest corn-yield equivalent of all the five areas under measurement on which the crops are partially or all grazed out.

Good quality yearling Hereford steers and heifers have been used for the grazing trials. They were turned on the wheat about the third week in April, and grazed there until about June 15, when the wheat was gone. They were returned to the area about July 1 for the grazing of the lespedeza, and remained there until about October 1, when the area was disked and drilled to wheat. By this system, neither labor nor farm machinery is used on the areas except in the fall, when the weather, as well as the supply of farm labor, is generally more favorable for field work than the spring and early summer. The lespedeza has reseeded itself each year after the original seeding. Agricultural lime at 3 tons per acre was applied at the beginning of the experiment, and 100 pounds per acre of 0–20–10 fertilizer is applied each fall when the wheat is drilled.

This cropping system, with the soil treatment, has provided good erosion control. The soil loss has been only 27 percent of that from the corn-oats system, and 57 percent of that from a corn-oats-meadow system. The wheat-lespedeza combination has given better erosion control than any of the common cropping systems except continuous grass. This is because it provides a growth of surface cover throughout most of the year, particularly during the season of heavy rainfall. Ordinary disking of the lespedeza in the fall mixes the stubble with the soil without complete covering. A field cultivator would do even a better job. Thus, some protection against erosion is provided during the period in which wheat is developing. During the summer the thick foliage of the lespedeza prevents rain from beating on the soil, and the sturdy stems form barriers to runoff water. Wheat provides protection during the spring. On sloping land, however, contouring, and generally terraces, are necessary supporting practices for ideal erosion control.

Timothy-lespedeza and timothy-sweetclover-lespe-

EDITOR'S NOTE.—The author is project supervisor, Soil Conservation Experiment Stations, Columbia, Missouri.

deza are other pasture systems that give even better erosion control than wheat-lespedeza, and required no labor, power, or machinery, except when started or renewed. These are systems that do not require supporting practices for control of erosion when once established, and when the waterways are covered with grass. The beef production by these two systems has been at the same figure to date, but was only 85 percent of that from wheat-lespedeza. It has averaged 225 pounds per acre, or an equivalent in corn production of 35 bushels per acre. These systems have given almost perfect control of erosion, and the area with the sweetclover has had an extremely low loss of rainfall as runoff. The soil in both these systems has been limed, and it received 0–20–10 fertilizer when the systems were established. They have not had the annual applications of phosphate and potash that were used in the wheat-lespedeza, but they will receive 0–20–10 fertilizer at intervals of about 2 years in the future. The production and measured erosion losses from several of the systems under investigation on gently rolling Putnam silt loam soil are given in the accompanying table.

These pasture systems meet the requirements of ideal farming plans for a large acreage of rolling lands, particularly those of medium to low fertility. They provide fertility maintenance, since commercial fertilizers are periodically applied and manure is left on the land by the grazing animals. Adequate erosion control may be had with these pasture systems by the use of the less expensive supporting practices, because of the natural erosion-resisting qualities of the systems. The use of labor, power, and machinery in crop production is reduced to a minimum. The returns in production are at least equal to, and in most cases increased over, those of other systems of farming. This is a fortunate combination of more intensive production and profitable return on labor, all with a high degree of conservation of both the fertility and the body of the soil. It is a case in which soil is being conserved and yet pays big dividends.

Beef production and erosion from pasture systems of farming, compared with the older systems

System	Percent of rainfall lost as runoff	Soil loss in years required to remove the surface 7 inches	Production per acre		
			Pounds beef	Animal days	Corn equivalent
Wheat-lespedeza	34	300	265	170	41
Timothy-lespedeza	29	2, 300	224	154	35
Timothy-sweet clover-lespedeza	24	1, 600	226	175	35
Corn-oats-meadow	28	170			30
Corn-oats	38	80			24

Data from Putnam silt loam plots of 3 percent slope. Average annual rainfall for the 2-year period of erosion losses was 47.9 inches. Production figures are a 3-year average. Soil treatments of lime and 0–20–10 fertilizer were used on all plots except those of the corn-oats rotation.

GOOD NEIGHBORS

By WILLIAM X. HULL

BY A TRANSFER of funds from the office of the Coordinator of Inter-American Affairs to the Soil Conservation Service, and the cooperation of the Foreign Service of the State Department, it was made possible to bring to the United States last fall 25 Latin-American technicians for a year's study of the methods and practices used in our Service for conserving soil and moisture and controlling erosion.

The Foreign Service of the State Department worked with the Department of Agriculture of the various countries in selecting candidates for this study. Final selection was made by the Soil Conservation Service. The various embassies obtained transportation for each successful candidate and started him on his way to this country. The farthest traveler came from almost the very southernmost tip of South America while the closest arrived from our nearest island neighbor, Cuba. Here is the group, with the countries from which they come—

Jose Salvador Jauregui	El Salvador.
Anthony Lespes	Haiti.
Ricardo Alberto Leon	Mexico.
Javier Garcia Paredes	"
Emilio Zamudio	"
Humberto Ortega	"
Gonzalo Pedro Andrade	"
Manuel T. Rodriguez	Chili.
Jose Antonio Rugeles	Venezuela.
Alfredo Gustale Antonelli	Paraguay.
Gonzale Alfonso Moreno	Ecuador.
Lucio Garcia-Vasquez	Cuba.
Rodrigo Gonzalo Orellana	Ecuador.
Jose Orlando Suarez	Chile.

EDITOR'S NOTE.—The author is Latin American assistant, Soil Conservation Service, Washington, D. C.

Arturo Somoza	Argentina.
Paulo Parisio de Melo	Brazil.
Silvino Alqueres Batista	"
Ricardo Jahn Adoue	Venezuela.
Luis Arturo Fernandez	Costa Rica.
Jador Torres de Rezende	Brazil.
Carlos A. Fynn	Uruguay.
Fernando Sayan-Palacios	Peru.
Mario Augusto Baracco	"
Sebastian Anibal Romero	Venezuela.
Casiano Victor Quevedo	Argentina.

In the limited time of 1 year the best way to *learn* is by *doing*. Therefore, each man, after a short stay in Washington, was sent to some soil conservation district work unit. Here he became an integral part of the field staff, taking part in all the activities of the work unit. At the same time he was coached by our technicians. He was required to read and study texts and bulletins. He was encouraged to ask questions. He was made familiar with the techniques of agronomic, forestry, engineering, range, and wildlife practices. He put these practices to use in planning a farm or ranch.

Each student-guest became a member of a soil survey group and here learned the technique of soil surveys, conservation surveys, the making of land capability maps and tables—red land, green land, yellow land—and how to apply these capabilities to the farm plan and the farmer's individual problems. He visited and studied the work of our experiment stations.

One trainee writes:

"The Soil Conservation Service is doing its best to bring clearly out of the trainees the different aspects of soil and water conservation problem. But it is also the task of the trainees to do the best they can to make easier the help of the Soil Conservation Service. These boys know better than anyone else what point of the program is of a peculiar interest to them. Then, they have not to hesitate to ask any information on such a point.

"On the other hand, the attention of the trainees might be called upon the fact that the rules and technics of the Soil Conservation Service of the United States are not rigid standards for the Latin-American countries. Many of the technics involved may be understood as a starting basis for further investigation and researches on special problems, which can only be solved by appropriate means and methods. Besides, soil conservation is not only a matter of technics; it also implies a social and economic aspect *much more acute* in Latin-American countries than in the United States. It should be useful to point out this fact so the trainees could not be induced into some possible errors."

While carrying on these various studies, the trainee sends home many suggestions for adapting our practices to problems in his own country.

Because we cannot, in the United States, find locations where climate, rainfall, topography, and agronomic conditions coincide exactly with those of his home country, we try to locate the trainee where we believe practices are carried out that may easily be adapted to conditions at home.

During the last 4 months of each man's training and study, he is moved to various other parts of the country to broaden his understanding of conditions and practices.

Three languages are represented. The native language of those from Brazil is Portuguese; those from the Island of Haiti speak French; the rest converse normally in Spanish. All of the men were able to read English and most of them could talk it to some extent. But even when first mingling with our people they experienced little difficulty in getting along. There is a universal language the world around—that of signs, of pictures, and of diagrams that helps immeasurably. Yes, even to learning to jitterbug! One young man wrote me, "I am learning your very athletic dance, the jitterbug."

That these men appreciate the opportunity that has been afforded them to visit our country and to learn the principles and practices of soil conservation is expressed in their every action, and particularly in the way they apply themselves. At the same time our own men have learned many things about South and Central America that they never knew before.

To say that these men are one of the factors in our good neighbor policy is putting it mildly. They are themselves good neighbors. When they return to their home countries, their peoples will be shown that the "good neighbor policy" is little more than instilling in each of us—whether from the United States of North America, from West India or from a Latin American republic—that we are all "American."

Next year we are to have another group of 25 technicians from our good neighbors to the South. These will undoubtedly profit from the experience we have had in teaching—and learning from—the pioneer trainees now with us.

KEEPING IN TOUCH

Division chiefs of SCS regularly write letters to former employees now in the Army and Navy, telling the things they want to hear about their jobs and their former associations.

EMPLOYEES FIGHT WAR WITH DOLLARS

ON MAY 4 the Soil Conservation Service was publicly acclaimed in the Department of Agriculture auditorium because of the fine record of its employees in financial support of the war. Recognition came in the form of a War Savings Bond Flag and an Honor List Certificate awarded by the Department of the Treasury.

Soil Conservation Service was the first large group in the Department to reach the twin goals of 90-percent-or-better employee participation with at least 10 percent of the pay roll invested through the pay roll savings plan.

Grover B. Hill, Assistant Secretary of Agriculture, was master of ceremonies. T. Roy Reid, director of personnel, received the awards on behalf of the Department from E. F. Bartelt, acting chairman of the Interdepartmental War Savings Bond Committee. H. H. Bennett, Soil Conservation Service chief, proudly accepted the flag and certificate for the 7,470 employees—and shortly thereafter placed the trophies on display near his office on the fourth floor of South Biulding.

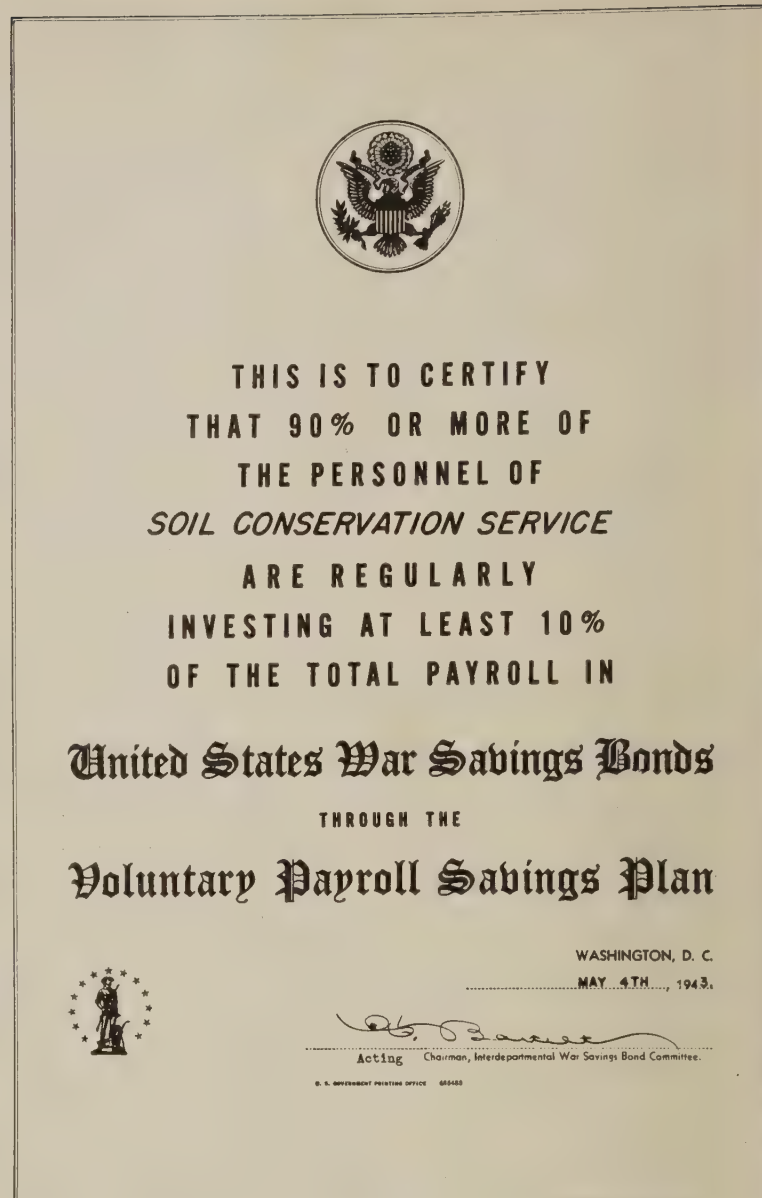
Mr. Bartelt remarked that "It is especially fitting that the Soil Conservation Service, which by its provident foresight has made such a valuable contribution to the vital wartime food supply of our Nation, should again be in the forefront of another essential part of our war economy."

The presentation in the Department of Agriculture Auditorium. Left to right: Grover B. Hill, Assistant Secretary of Agriculture; H. H. Bennett, Chief of the Soil Conservation Service; C. C. Craver, Jr., Treasury Department; Henry Herrell, Office of Budget and Finance, Department of Agriculture; T. Roy Reid, Director of Personnel, Department of Agriculture; John S. Fickling, SCS Chairman of Payroll Savings Plan; E. F. Bartelt, Acting Chairman, Interdepartmental War Savings Bond Committee, and Charles Mead, Treasury Department.

April recapitulation showed that 91.2 percent of employees in Washington and the field were investigating 10.6 percent of the total pay roll in War Savings Bonds under the pay-roll savings plan. Of those employed in the Capital, 84.7 percent were investing 9.1 percent of the total pay roll. Of employees carried on the field pay rolls, including Beltsville, 91.6 percent were earmarking 10.7 percent of their combined pay rolls for War Savings Bond deductions.

Among the 29 major agencies in Washington, the Service is in a two-member tie for fourteenth place, and of the 22 Government bureaus operating in the field it is in a two-place tie for fourth.

Chief Bennett has personally commended the employees of the Budget and Finance Division, Pacific coast region, for having achieved the highest record of all our offices having 10 or more employees, in purchases made under the pay-roll savings plan during the month of April.—*John S. Fickling.*



THIS IS TO CERTIFY
THAT 90% OR MORE OF
THE PERSONNEL OF
SOIL CONSERVATION SERVICE
ARE REGULARLY
INVESTING AT LEAST 10%
OF THE TOTAL PAYROLL IN

United States War Savings Bonds

THROUGH THE

Voluntary Payroll Savings Plan

WASHINGTON, D. C.
MAY 4TH, 1943.

Acting Chairman, Interdepartmental War Savings Bond Committee.

ONE MORE HOUR TOWARD VICTORY

ON MAY 31—the Monday following Memorial Sunday—offices of the Soil Conservation Service opened an hour earlier than usual, and closed an hour later. This was to accommodate the large number of employees who volunteered to work an extra hour in honor of the men who have died in the service of their country. SCS received widespread newspaper attention in Washington as the first major agency to adopt this form of commemoration. The extra hour was optional with each employee, and was worked at either the beginning or the end of the regular period.

In commenting on the observance, Dr. Bennett said, "The amount of time is small, but to me it symbolizes a much larger feeling of our debt to the men who have given everything within their power to give, that America and our American way of life may be preserved."

EVER HEAR OF A METAL "DOODLE BUG"?

The idea pot is bubbling merrily.

Numerous suggestions are spattering into Washington and the regional offices from employees whose minds are occupied with efficiency-making thoughts that deserve sharing.

From C. O. Ferguson, work unit leader of the Navarro-Hill Soil Conservation District down in Texas, comes a summary of seven "practices now in operation and suggestions for work improvement"—not all of which, he points out, are "original."

Among other things, Ferguson favors an "E" for outstanding district cooperators who are increasing production for war needs. He notes, too, the usefulness of vocational agriculture classes in the sodding of terrace outlets and pastures, and infers that such classes might be recruited for other needed labor. He points also to the adaptation of district work plans as supplementary school texts in Limestone County.

One of Ferguson's most practical suggestions has to do with an instrument dubbed the "doodle bug." The device is easily made from a welding rod. It is pronged at one end, the points of each prong being one-fourth inch apart; this width is equivalent to 10 rods on an aerial photograph. The doodle bug is "walked" along a fence or terrace to measure its length.

U. S. GOVERNMENT PRINTING OFFICE: 1943

For REFERENCE

Compiled by ETTA G. ROGERS, Publications Unit

Field offices should submit requests on Form SCS–37, in accordance with the instructions on the reverse side of the form. Others should address the office of issue.

SOIL CONSERVATION SERVICE

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Cross-slope irrigation reduces erosion, conserves water, and improves the quality and the yield of row crops.

In times past, water has had much to do with the winning of the West. Today, water has a large assignment in the winning of the war.

Just how important is this assignment may be gathered from a reading of the crystal-clear report by Irrigation Engineer D. A. Williams, which opens this July issue and, incidentally, Volume IX of SOIL CONSERVATION.

The Williams article, "More Food from Improved Irrigation," is an exciting and yet simple, factual statement of policy and practice on the thirsty acres of the sunset States.

The fight is to save soils, conserve moisture, and squeeze out an ever-higher war production. Irrigation farmers, in striving toward these objectives, are making effective use of soil conservation districts. As did their pioneering forebears, these farmers know the wonders that can be wrought by meeting their problems in partnership.—THE EDITOR.

August 1943

SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

NITED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

Contents

WELLINGTON BRINK
EDITOR

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SOIL CONSERVATION

CLAUDE R. WICKARD
SECRETARY OF AGRICULTURE

HUGH H. BENNETT
CHIEF, SOIL CONSERVATION SERVICE

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WOOD FOR WAR

BY A. E. FIVAZ

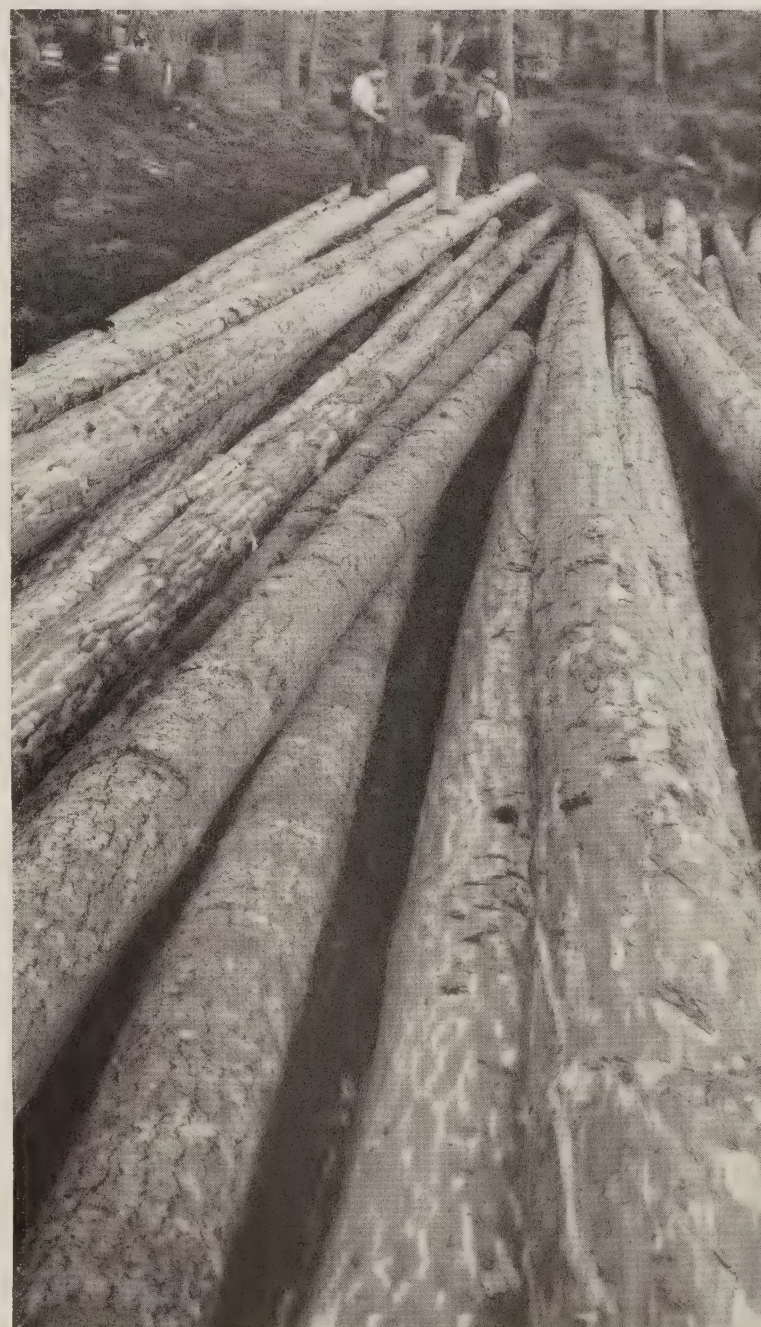
IN EVERY FIGHT on every front the products of American forests are performing tasks essential to an Allied victory.

From the 10 carloads of lumber required for the deck of a big battleship to the vital bit of nitro-cellulose in a Garand rifle cartridge, from the charcoal in a gas mask to the many billions of board feet of lumber required for boxing and crating equipment, food, and other material for our armed forces, from tanning extracts and walnut gunstocks to paper, fiber board, plastics, and rayon derived from wood pulp, from wooden barracks to lend-lease shipments, our tree crops in every form have gone to war.

On the home front, too, wood is a war worker. It contributes lumber for the construction of war plants and defense housing, stove lengths for fuel, timbers for mines and railroads, materials needed by farmers in producing food and fiber. Truly, wood is vital to our ability to "Pass the Ammunition!"

The supply of many forest products is inadequate to meet the demand for essential war uses alone, much less that for the normal civilian consumption. Take lumber, for example, which constitutes the biggest item of the forest crop. Before Pearl Harbor total 1942 requirements were estimated to be 33.8 billion board feet. Although we produced approximately 34.8 billion board feet of lumber in 1942, the demand for wood for war purposes increased our consumption to 40.3 billion feet. Imports, chiefly from Canada made up about 1.5 billion feet of the deficiency; the rest came from seriously depleted and unbalanced stocks on hand at the sawmills, factories, and lumber yards. This year's minimum requirements for all essential purposes have been estimated as around 31.5 billion feet after providing for a very sharp curtailment of less essential civilian consumption. In order to meet even this very conservative figure, the War Production Board has set a production goal of 32

EDITOR'S NOTE.—The author is Assistant Chief, Forestry Division, Soil Conservation Service, Washington, D. C.



Douglas fir piling harvested from a farm woods is ready to move into action—perhaps to strengthen a Pacific waterfront structure loaded with food and munitions for our fighting forces, or perhaps to help develop a beachhead on some distant shore.

billion feet. In the first three months of 1943 the lumber industry was not able quite to reach its first quarter quota, and is facing increasingly serious handicaps the rest of the year. Mill facilities are ample but manpower is critically curtailed.

Fuel wood, the second biggest part of the forest crop, likewise faces a rapidly increasing demand because of shortages in other fuels, and a rapidly declining production resulting from reduced labor. Failure to supply this year's estimated requirements of around 85 million cords will mean increased strain on supplies of other fuels and on transportation facilities, perhaps distress and illness next winter.

The relation of pulpwood production to essential requirements presents another critical picture. Recently the War Production Board stated:

Pulpwood in tremendously increasing quantities is required in making shipping containers, smokeless powder, shell cases, rayon, heavy-duty multi-walled sacks, photographic film and paper, medical supplies, plastics, map and blueprint papers and hundreds of special products for war uses. Over a million and a quarter tons of paperboard—2,250,000 cords of pulpwood—will be used in 1943 to package food, supplies, and munitions for overseas shipment.

It is now evident that wood-pulp requirements for 1943 will be considerably in excess of the probable supply of pulpwood. Therefore, it will be necessary to produce during the current year all of the pulpwood that can be cut in the various regions.

Certain forest products are listed by the War Production Board as critical materials, supplies of which are insufficient either for war demands alone or for war plus essential civilian demands. In addition to a large number of lumber items the list includes certain wood plastics and rayons, wood alcohol, charcoal, hardboard, and plywood.

THE FARMER'S SHARE OF THE JOB

American forests are adequate in area, stand, and growth to supply through conservative cutting all of these essential wood requirements. This country has a total of 461,697,000 acres of commercial forests, of which 138,812,000 acres are part of our farms. The big job that must be done as a part of the war effort is to harvest, market, and manufacture the forest products that are so badly needed, despite the reduced manpower available. Since about a third of this Nation's annual forest crop comes from the farmwoods, American farmers have an important share of the responsibility of producing more wood for war, a more important share than many folks realize.

Sawlogs delivered to the mill by the farmer who harvests them from his woodland will enable the lumber industry to speed fighting wood to war in the quantities needed.

It is true that manpower is extremely short on farms, too, but after the crops are harvested the load of urgent work generally drops sharply and many farmers will have time to turn to the harvest of the forest crop.

CONSERVATIONAL CUTTING ONLY

A complete victory cannot be won at the cost of irreparable damage to our farm resources. Our

American forests are capable of meeting all our timber requirements this year—and every year—from conservative cutting that will leave every acre fully productive.

farmwoods are one of these vital resources. Fortunately, they can supply ample wood for war, without the devastation of a single acre. But the harvesting must be wise. It must single out the occasional ripe trees, the cripples, the "boarders," and leave the "producers" to make successive crops, crops for the war years, for the period of rehabilitation, and for steady future national development.

Some 3,000,000 farms include woodland classed as capable of producing commercial products. If the operators of each of these farms worked an average of 4 or 5 days harvesting and moving badly needed forest products to market, the supply would be fully adequate for all essential war requirements. Not all farmers will be able to do this, but others can do even better. Calling in a stumpage buyer will not be so much help as this, either to the country or to the farm income. The largest benefit accrues when the farmer markets his labor along with his crop. Present marketing opportunities are most favorable for improving profitably the growing condition of his woodland through selective cutting.

In many parts of the country, outstanding farmers already are participating actively in the production of more wood for war. They believe that if extra days of work in the farm woods will hasten victory ever so slightly those days will be well spent. They also recognize that careful harvesting of wood products improves the quality and growth of the woodlands. Reaping good profits now, they are also increasing their security for the years ahead. From soil conservation districts and farm forestry projects come reports of what these farmers are doing with a little help and guidance from the Soil Conservation Service.

FARMERS IN ACTION

Earl Lester, a farmer cooperating with the Davy Crockett-Trinity County Soil Conservation District in Texas completed a selective cutting of $740 worth of timber marked by a district technician on 40 acres of woodland. He hired neighboring farmers to help with the cutting and delivered the logs to the mill on his own truck. Mr. Lester said, "I got $20 per thousand for my pine logs delivered at the skidway because I had a few big trees that would fill a special mill order for some 22- and 24-foot construction timbers. I don't see any grounds for the common statement that farmers don't have the power or equipment to do their own cutting, skidding, and loading. I skidded and loaded logs up to 34 inches in diameter at the butt and 16 feet long, with a pair of mules that weighed less than 900 pounds apiece." He has a good stand of growing timber left on this woodland instead of the bushy waste that very likely would have remained had he accepted a $500 lump sum offer for all his merchantable timber.

Several farmers in California are going Mr. Lester one better. The Pajaro Valley Soil Conservation District is principally an apple producing section. The movement of this fruit to the consumer requires 3,000,000 apple boxes a year, and these cannot be supplied by the California box shook industry. George E. Tindall, a farmer in this district, was induced to start manufacturing 6,000 apple boxes and 2,000 grape lugs from second growth redwood on his farm. A neighbor, Mr. Cusack, is interested in supplementing the operation with more machinery and farm timber to produce nearly a million board feet of box shook. Incidentally, Mr.

Tindall is moving other products to the war market from his farm woods, including 100,000 feet of car stock, 40 cords of tanbark, and 162 cords of fuel wood.

Across the State of California, T. H. Brunius, a farmer cooperating with the El Dorado Farm Forestry Project, has just reorganized his veneer plant to manufacture standard Los Angeles lugs (fruit boxes). He will harvest timber from his own farm and from that of another farm forestry cooperator, and expects to manufacture box shook for 300,000 lugs from selective cuts in this Ponderosa pine timber.

Not only do California farmers produce food for freedom, but also they produce the containers needed to make delivery of that food possible. Fifteen other farmers on the El Dorado project, through conservative cutting of their farm woods, are supplying about 6,000,000 board-feet of Ponderosa pine lumber for the manufacture of ammunition boxes.

Farmers near the Piedmont Land Utilization Project, Eatonton, Ga., are profitably marketing their labor between crop seasons and helping meet the war demand for wood by undertaking the harvest of forest products from lands administered by the Soil Conservation Service. Over a hundred farmers have bought stumpage and are marketing badly needed logs, pulpwood, ties, fuelwood and other products from these government lands. Farmers are doing likewise in the vicinity of land utilization projects in other States, including Florida, Mississippi, North Carolina, Kentucky, Oklahoma, Delaware, and Pennsylvania. On projects where the amount of ripe timber is more than can be handled by local farmers, the Soil Conservation Service is selling the excess to commercial operators.

Even in the Prairie States, not generally associated with production of forest crops, local timber is being selectively harvested. The Labette County, Kans., Soil Conservation District has obtained the loan of two trucks and trailers to move logs to the mills. As a result, three local sawmills will operate most of the year instead of their ordinary season of two or three months. The mill men like the idea of selective cutting. They are getting larger logs and better quality of lumber, and sawing more volume with less man-days of labor.

The farm forester at Parsons, Kans., has persuaded a local farmer elevator cooperative to go into the business of finishing local lumber so that farmers in this "lumber-drought" area may obtain materials essential to their food production job.

At Garnett, Kans., there is a small plant manufacturing egg crates, which was held down to 3 days' operation a week because of the difficulty of securing shipments of cottonwood from the South. Farmers in soil conservation districts within 25 miles of this plant have sufficient ripe cottonwood timber to more than double the essential production of crates, and supply local rough lumber needs as well. Soil Conservation Service personnel assigned to these districts are bringing the supply and the demand together.

At Ten Sleep, Wyo., and at Chadron, Nebr., soil conservation districts have set up small cooperatives for treating locally produced fence posts. Farmers and ranchers were having difficulty getting enough posts from normal sources. Farmers in the Turtle Mountains near Bottineau, N. Dak., organized a cooperative marketing association under the guidance of the local farm forester, to handle fence posts and fuelwood.

Nebraska farmers are supplying quantities of black walnut timber for gunstocks from trees appraised as to value and recommended for cutting by technicians assigned to soil conservation districts or to the farm forestry project. Not only are they receiving full value for the trees sold, but their smaller trees are being saved for future crops.

In Wisconsin, a very effective procedure is bringing together the farmer who has merchantable timber, the small mill man, and the prime contractors. Interested State and Federal agencies have established a State Timber Marketing Committee to serve as a clearing house for information on needs and supplies. A bulletin is issued and distributed periodically to farmers, mills, and contractors.

Here is how the bulletin works: A farmer living near Wausau, has 15 acres of woodland from which he wants to sell as stumpage a selective cut of white pine. He looks through the bulletin for a nearby buyer of pine stumpage and closes a satisfactory deal. The pine is logged and cut to the specifications of a box company listed in another part of the bulletin. The box company had stated in the bulletin: "Products manufactured—ammunition boxes. Use—armed forces. Present supply insufficient, need urgent!"

H. A. Gillette of Columbia, Conn., is an aircraft worker who also does some part-time farming. With the help of a farm forester Mr. Gillette has marketed from the 30 acres of woodland on his farm a cut of hardwood logs of ship timber and railroad tie sizes. Aircraft parts he helped manufacture may even now be speeding to the fighting fronts by rail and ship—ships which he helped to build.

Three farmers in the farm forestry project near Washington, N. J., had small amounts of merchantable timber, amounts generally sold only to small mills at very low prices for uses that can be ade-

quately filled by low-quality logs of inferior species. These three farmers arranged through the farm forester to pool their prospective wood crops in a single offer, which was made to 34 timber buyers. A very attractive bid was accepted and the trees are headed for the shipyards, in the long lengths required for PT boats and subchasers.

In the farm forestry project in Adams County, Pa., farmers are sending their wood to war, sawlogs to mills manufacturing high priority furniture and the tops and poorer trees as pulpwood to the paper plants. Even the bark of the trees is made to serve, that of chestnut oak going to leather tanning plants.

New England is noted for many things, including its conservatism, shipyards, and patriotism. The last is a blending agent in the case of farmers near Pleasant Valley, Conn., who have been cherishing groves of stately oaks on their farms for generations. They are marketing a crop of the largest of these oaks, carefully selected by the farm forester, for the huge timbers, and the knees for fighting ships, food cargo vessels, and other war construction.

Fighting farm timber is also moving to market in Maryland. On the farm forestry project near Jarrettsville, yellow poplar reaches large size, and high-grade yellow poplar logs are badly needed for aircraft veneers. George K. Gettings sold 70 of these picked trees, and the woodland on a fine old estate near Towson, Md., owned by Mrs. William C. Stettinius is yielding many magnificent yellow poplars from 26 to 42 inches in diameter. The farm forester reports that the first 66 trees marked for cutting contained 44,000 board feet of veneer stock.

It is a long jump from Maryland to the Pacific Northwest, but there, too, fighting trees are coming out of farm woodlands. The urgent demand for long Douglas fir piling found the Washington Forest Products Cooperative Association prepared. Organized in May 1940 by 45 farmers in the vicinity of the Snohomish CCC camp operated by the Soil Conservation Service, this first forest products cooperative west of the Mississippi is serving as a vital connecting link between the farm woods in the Snohomish Soil Conservation District and the war markets. Twenty members marketed $40,000 worth of farm-woods products through this association last year, and most of the harvest was of critical war materials. Douglas fir piling 90 to 135 feet long is one of these. Sawlogs, poles, and fuel wood were also important products.

In the Otero Soil Conservation District in New Mexico, cooperator Fred Griffin has marketed over a quarter of a million board feet of mature and over-

This fruit grower is making sure that the apple crop will be safely packed for shipment. He is himself converting selected trees from his farmwoods into box shook.

mature pine and fir trees from his farm woods. All the lumber and smaller timber being produced is going to serve in the potash mines at Carlsbad, N. M. The slabs and sawdust are substituting for coal for civilian use in the town of Artesia. Even the slash is being used, this to help control erosion on adjacent cultivated land producing war crops.

In West Virginia trees killed years ago by an Asiatic blight are returning as ghosts to fight a new Asiatic menace. Dead chestnut by the carload is moving to tannin extracting plants from farms on the Ronceverte farm forestry project, perhaps to fit shoe leather for the marches on Tokyo and Berlin.

The pine and hardwood lumber industries in the 12 Southern States are facing the greatest problems in trying to meet their large share of the national lumber production goal. At the request of the WPB and the war committees of the industries, the Soil Conservation Service is giving special emphasis to the farm woods-harvesting phase of its wartime program. On every farm forestry project and in the hundreds of soil conservation districts throughout the South, more farmers are being encouraged and helped to harvest and market wood for war. Here, as with food, the keynote is more production through conservation. Applied to the farm woods, this means selective cutting for sustained yield, and complete utilization of all trees cut. A good illustration is the woods harvest made by J. L. Nave, a farmer on the Oklahoma farm forestry project near Broken Bow. Marked trees from his 69 acres of upland pine and hardwoods yielded 53,000 board feet of sawlogs; from the tops of the sawlog trees, 131 railroad ties were sold, and further top utilization produced 16 cords of fuel wood. This elimination of waste added many dollars to the profit realized by Mr. Nave from his wood crop.

Many southern farmers are learning from expe-

rience that by making periodical cuttings of pulpwood on their piney woods they can increase the growth of sawlogs while making substantial monetary profits from the pulpwood harvests. Farm forestry cooperator M. A. Thigpen, Franklinton, La., is harvesting 250 cords of pulpwood, and actually improving growing conditions for the sawlog trees on part of his 200 acres of farmwoods. A neighbor, S. E. Magee, was reserving the timber on 125 acres of farmwoods to put his 12-year-old son through college. He saw the wisdom of improving his woods growth by cutting 300 to 400 cords of pulpwood and over 150,000 board feet of old pine and gum. As a result, his son's education will be further assured by a better woods, plus approximately $2,000 in War bonds from the profits of the thinning and discriminative cutting. The local pulpwood contractor, Frank Richardson, asked to have his woodland marked for a pulpwood thinning. The farm forester reports that this timber was being reserved, and would not otherwise be available for war use. Another farmer who does not need the income is considering the sale of a million feet of sawlogs, only because the farm forester recommended it to meet the war need, and will assure that good forestry practices are observed.

With the help of a neighbor, P. A. Griffon of Spearsville, La., removed 91 cords of pulpwood in thinning 23 acres of dense pine woods to speed up its growth, cashing in nearly $160 for the stumpage and profit, and over $130 for the labor. This piece of woodland will be ready for another thinning 5 years hence. In these thinnings, the main crop of trees is given more room to grow, the profits coming entirely from superfluous trees that would otherwise die and rot away. These examples of farmers helping win the war by woodland conservation, which means wise use, are being repeated in many districts and projects in all the Southern States.

This report of the war job of farmers in their farm woods would be entirely inadequate without reference to the fight against forest fire. Last year, 200,000 fires—500 for each day in the year—destroyed timber of sufficient volume to build 20,000 Liberty ships, or 2,000,000 army truck bodies. As expressed by the American Forestry Association, the wood that is thus being destroyed is desperately needed to keep our war plants operating at full capacity, and to keep our fighting men supplied with food, arms, and equipment. American farmers must help reduce this tremendous leak. Every fire that burns the farm forests is a threat of defeat. Many farmers are already doing something about this enemy in our homeland. The governing bodies of all the soil conservation districts in southeastern Minnesota have organized to prevent and control forest and farm woods fires through education and the addition of fire-fighting equipment. In the Richland Creek Soil Conservation District in Kentucky, 70 percent of the farmers are enrolled in the district-sponsored fire-control association. Other districts in other States are following suit, and farmers individually are taking increased precaution to prevent fires and promptly control those that do start.

LATEST PROGRESS REPORT

In May the employees of the Soil Conservation Service, Washington and the field, invested nearly $200,000 in War Savings bonds under the pay-roll savings plan. This was a gain of more than 46 percent over the investments made during the month of January.

Since the first of the year, the Service's field offices have increased their standing among the 22 bureau field offices from twelfth place to third place in the percent of pay roll allotted and the Washington office of the Service has moved up to seventh place from twenty-sixth place among the 29 major bureau offices in Washington.

Our Government expects us, who are in its civilian service, to show the way in buying war bonds by participation in the pay roll savings plan. The outstanding record of the employees of the Soil Conservation Service has shown that we have accepted this challenge. The most we can invest in democracy is the least we can do.

The employees of the land acquisition division, Washington, were personally commended in a letter from the chief for having the highest record of all offices of the Service for the purchase of War Savings bonds under the pay roll savings plan for the month of May.

—John S. Fickling.

SOUTHEAST ENLISTS HALF-MILLION IDLE ACRES IN WAR EFFORT

A total of 520,000 acres of formerly idle land in the Southeastern Region has been put to productive use on 50,000 farms for which complete conservation plans had been developed as of December 31, 1942. Nearly 150,000 acres have been planted to perennial hay crops, principally kudzu and sericea lespedeza, and will provide feed for production of milk and meat needed in the war effort, Regional Conservator T. S. Buie of the Soil Conservation Service points out.

More than 140,000 acres have been brought back into cultivation and are being protected against erosion by the use of terraces, contour tillage, strip cropping, and improved rotations. Some 116,000 acres are being developed for improved pasture, nearly 90,000 acres have been converted to woodland, and the remaining 24,000 acres are being devoted to wildlife, orchards, vineyards, and miscellaneous uses.

The 520,000 acres of formerly idle land represented 6.2 percent of the land in farms, or an average of 10.4 acres per farm, which has been enlisted in the war effort through sound land use. In addition, increased yields are being obtained through conservation farming practices which have been established on all of the 8,400,000 acres comprised in the 50,000 farms covered by conservation plans.

Pipe line water in the largest soil-conservation district is making it possible for vital beef herds like this one of Heckethorn's to increase and fatten to help whip the Axis.

IT'S THE WATER THAT COUNTS

By Kenneth E. Bradshaw,[1] Cale C. Johnson,[2] and Frank B. Harper[3]

IN NEVADA, with the smallest capital in the United States and some of the biggest sheep and cattle ranches out-of-doors, it truly is the water that counts—water that for the most part flows down out of the winter's snow which caps the seemingly endless succession of mountain ridges, into the high valleys between. The snow water literally laughs at the scant 4 to 8 inches of annual rainfall, because it, rather than the rainfall, is the factor which makes or breaks the bulk of the crops.

TODAY, Nevada ranchers, especially in soil conservation districts, are making that water count for the all-important purpose of helping to win a war. It is in substance the working out of a quite simple equation: Water makes pasture and hay grow; this feed produces many cattle and sheep; the latter provide meat and animal fiber and leather. These end products contribute importantly to feeding and clothing America's fighting men and women, war plant workers and lend-lease Allies.

[1] District Range Conservationist, White Pine Soil Conservation District, Ely, Nev.
[2] District Conservationist, White Pine Soil Conservation District, Ely, Nev.
[3] Division of Information, Pacific Coast Region, Portland, Oreg.

If you would like to see soft, crystal-clear waters coming out of mountains, which tower to 13,000 feet in elevation, down into 6,000- or 7,000-foot-high valleys, visit White Pine County, in east-central Nevada along the Utah line.

This is the location of the largest soil conservation district in the United States, or anywhere else, for that matter—5,628,800 acres covering the entire county. Of this staggering acreage, only part is privately owned, the rest being public lands administered by the Forest Service, Grazing Service, and Indian Service.

Ely, near the center of this typically western block of country, is the county seat. If Chairman Arthur Carter of the White Pine Soil Conservation District is too busy on his own ranch to play host to you, District Conservationist Cale C. Johnson of the Soil Conservation Service can be persuaded to take you to North Spring Valley, where you can see some good examples of what water developments are doing for the war effort.

Since long before the Indians ground their grain and other native seeds in crude stone mortars and pestles (primitive implements still to be found in these Nevada valleys), water has flowed abundantly out of the steep canyons that dissect the high moun-

tain range on the western edge of this valley. It has plunged down the steep foothill slopes, rolling rock and gravel before it to build up broad alluvial fans, and finally wasted itself in the alkali sinks and marshes of the flat, landlocked valley below.

Then came the white man and his herds and flocks, and the gradual, generations-long development of the present characteristic western livestock set-up. Valley headquarters were established where supplemental winter feed could be grown on fertile bottomlands cleared of big sagebrush and rubber rabbit-brush and greasewood, and watered by mountain water. Water holes dotting the public lands provided coveted bases from which cattle and sheep could range in the piñon and juniper covered mountains, and over the desert lands below.

Unfortunately, though, less than half of the precious mountain snow water ever found its way to the roots of pasture and hay crops. The streams had built their own traps in the form of the huge alluvial fans, into whose porous, gravelly interiors most of the precious water sank. Upland ranges were depleted through the years of constant grazing; and, in the end, there was a clear need for better and more economical use of the vital water resource, even before Pearl Harbor made the individual rancher's need one of common national necessity.

The first of what will be a long list of pipe-line developments to corral this wild mountain water and multiply its usefulness in wartime and peace, was installed on Mrs. Marion Yelland's ranch in this valley in the spring of 1941. As the White Pine Soil Conservation District did not get under way until the summer of 1942, this water facility was made possible through a State Extension Service—Soil Conservation Service demonstration plan, now expanded into a district plan.

If Mrs. Yelland is not home, drive down and talk to one of her four sons, who will probably be found busy marking off for irrigation the latest field of good valley land they have cleared. Such clearing precedes what will probably be an 8-year soil-conserving rotation—2 years of small grains and row crops, such as potatoes or corn, followed by 6 years of alfalfa hay. Any one of them (Kent, Bill, Lou or Henry) can tell you about the 10-inch concrete pipe line, more than a mile long and 30 inches underground, that will carry in a steady flow, without loss in the alluvial fan, up to 5 second-feet of water from turbulent Taft Creek. The pipe line is supplied from a masonry dam across the creek via a 110-foot rubble masonry ditch with safety overflow spillways. It empties into a masonry velocity-reducing outlet ditch 50 feet long, and a diversion box that turns the water into the distribution ditch.

The season-long dependability of the new irrigation stream makes possible the increased production of vital feed on between 400 and 500 acres of their 1,300-acre ranch. Before 1941, 90 acres of that land was in native desert brush; and any amount of labor and coaxing could not keep the water flowing over its thirsty, gravelly bed throughout August and September when it was needed badly on some 335 acres of native meadow hay and pasture. The Yellands report, however, that since installation of the pipe line, for the first time in the half century history of the ranch, there has been irrigation water available in mid-September.

Kent, for example, will tell you:

"In 1941, before the pipe line had been in long enough to do us much good, we cut 27 stacks of hay, averaging 10 tons to the stack. Last year, 1942, we cut 37 stacks, or better than one-third more! As dry as it was last summer, we would have cut only 15 or 20 stacks at the most without this water."

He refers to the cutting of their native meadow which has been reseeded to clover and grass and fertilized with corral manure. Both of these practices, incidentally, are basic in the White Pine District program.

Despite depredations of jackrabbits and blackbirds last year, the Yellands likewise harvested around 8 tons of grain, a decided increase over the 5 tons produced the year before. This was on a piece up at the "home place" watered directly out of the pipe line. There were Food for Freedom potatoes, too, and other new crops made possible by the water.

Now as to the next element in the Yellands' water-feed-livestock equation: In the spring of 1935, they were down to only 52 head of good grade range Herefords. At the last count, in the fall of 1942, they had 330 head, including calves. In addition, they run a band of about 1,200 ewes.

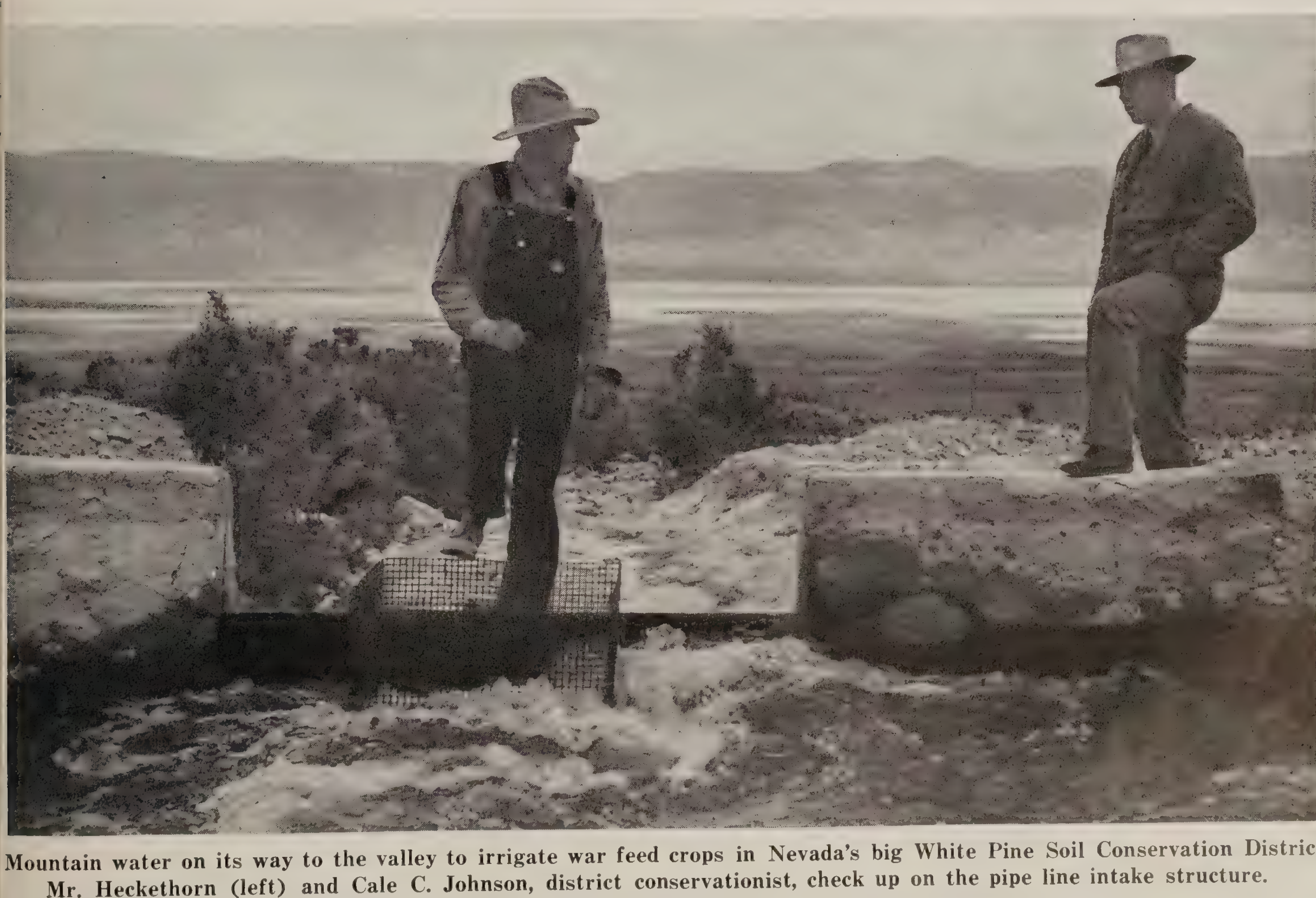
"With this water," Kent adds, "we are cleaning off the brush land for alfalfa as fast as we can, with close to 60 acres already broken out. We probably can get 200 acres altogether. With that much extra land producing feed, I'd say we could run 600 head of cattle, or maybe more. We figure on getting most of it in within two more years. We never could have done anything without the pipe line water."

They have not bought a single cow, but expanded by natural herd increase; and they keep up herd quality and boost their wartime marketings by selling off the old cows and culls with the regular beef stuff.

Speaking financially, is the pipe line worth what it cost the Yellands?

"We've already got our money's worth," quoting Kent once more. "Why, we sold 100 tons of last

The old channel of McCoy Creek. Formerly, this gravelly alluvial fan drank up nearly all the water by late summer, when it was needed most for bottomland hay and other crops.



Mountain water on its way to the valley to irrigate war feed crops in Nevada's big White Pine Soil Conservation District. Mr. Heckethorn (left) and Cale C. Johnson, district conservationist, check up on the pipe line intake structure.

The pipe lines are contributing to efficiency and comfort around ranch headquarters, too. Electricity is generated by a small turbine installed in the Heckethorn pipe line for lighting, feed grinding, and other uses.

year's extra hay for $15 a ton, and right there repaid much of the cost of the whole thing. And don't forget, we'll be able now to go way over our beef marketing war quotas!"

Adjoining the Yelland ranch on the north, and reaping benefits from a similar pipe line development, is Will S. Heckethorn's 1,960-acre place. Here, a 12-inch metal pipe line was installed in the spring of 1942. Carrying from 6 to 9 cubic feet of water per second from McCoy Creek across some 6,200 feet of porous alluvial fan, it aids in the irrigation of 900 acres of old hay and pasture land, and about 30 acres of newly broken land. An additional 80 or 90 acres are planned for clearing and cultivating.

Heckethorn previously managed to irrigate a comparatively small acreage in the spring and part of the summer, by keeping a man busy with team and fresno trying to hold the water in a delivery channel downslope to his bottomland. But, because of the improved water supply, in 1942 he topped his previous maximum production by 300 tons of hay. He explained this large increase by saying:

"Before getting the pipe-line water, I have seen the hay get up 8 to 10 inches high and then burn right down, because there wasn't water to keep it coming. Why, the sickle wouldn't even cut it. But now, having late water, we can keep it coming until cutting time. That's what makes the difference between a good, big crop and a poor one—or no crop."

The additional feed is being used to increase the pre-pipe-line herd of 600 head of cattle to 900 or 1,000. Despite increasing the herd, Heckethorn still has between 150 and 200 tons of hay left over from last year. He wants to keep a good supply on hand as "insurance" against a bad winter; therefore, he does not sell off all the extra hay he produces.

Aside from holding over reserve feed, Heckethorn carries out other good management practices. To balance the increased feed production and make a more stable unit, he has purchased a large share of a 50 square mile private summer range. He owns approximately 25 purebred bulls, too, which are steadily increasing the quantity and quality of beef sent off to market.

When asked about the value of increased aftermath grazing on his fields, Heckethorn was enthusiastic.

"I can't give you any figures; but, gosh, it makes an awful lot of difference," he replied. "We water the meadows after the hay is cut off, and it grows back faster than the cattle can eat it.

"Beside that, we are able to put water out on pasture land that never could be irrigated before, and practically the whole thing is wetted down now. By sowing grasses, it makes a lot of good pasture; and we're trying to get every inch of it into something, either hay or pasture. It's the water that makes the feed—everybody knows that!"

A unique feature of the Heckethorn pipe line is a turbine generator installed at the outlet. The electricity furnishes domestic lighting, and will save labor and food by running shop machinery, feed crackers and choppers, and a freezing unit.

To see a third example of pipe-line production, drop in at the 1,960-acre ranch operated by "Pete" Johansen, with the same problems as his neighbors in North Spring Valley. Heretofore, the amount of water reaching the valley from Bastian Creek would irrigate only 35 or 40 acres. A 2,600-foot, 12-inch metal pipe line leading into a small holding reservoir was completed in the spring of 1943, and now supplies water at the rate of as much as 6 cubic feet a second to approximately 450 acres of virgin land.

Johansen already has cleared and leveled 20 to 25 acres, and started his improved farming layout off on a purposeful wartime basis by putting in 5 acres of potatoes and a small acreage of dry beans, in addition to the feed grain that precedes alfalfa seeding on new land. This outfit runs 3,500 sheep and 75 head of cattle. Johansen figures on stepping up the cattle herd as he brings more bottomland into alfalfa production and brings up his hay and pasture yields on 700 acres or so of native meadow-

A 12-inch metal pipe line more than a mile long now carries the water across the thirsty stretch, and delivers it to the irrigation system.

New land coming into production. Heckethorn's dependable water supply means more hay, more cattle—more beef and leather—for the warbasket.

land. He already has started brushing off and fencing part of this preparatory to improving it further through grass seeding.

"We have plenty of land and will keep clearing it off until we reach the limit of our water supply," he explained between giving directions to one of his men for hurrying up preparation of the potato land for planting. "The pipe line and reservoir have way more than doubled the land we can handle.

"We have been getting 60 to 75 tons of hay a year, but I can use 100 tons right here and not have to go out and haul any. With this pipe-line set-up, I know we'll get a couple of hundred tons. I also am counting on alfalfa for seed, for I think we can raise all kinds of it."

Recalling the waste of water formerly experienced on this ranch, Johansen was of the opinion that the pipe-line cost would pay its way out in a reasonable length of time, to say nothing of increasing production in the meantime.

So runs the story of how pipe lines boost production for Victory in Nevada's big White Pine Soil Conservation District. It has been said that water is "the lifeblood of the West." Ranchers in the United States' largest soil conservation district are showing a way of developing that water to help "win the war and write the peace."

SAVING SOIL FOR SOLDIERS

BY P. K. HOOKER

NOT LONG AGO, Ernie Pyle, world-traveling columnist, told in one of his columns how a remark he had made in an earlier column had prompted a reader to send him a small packet of United States soil. Ernie's soldier friends gathered 'round and appeased their desire to tread again on the soil of their homeland by rubbing their bare feet in that little packet of the soil so precious to them.

It reminds me of an interesting news item attached to the 1942 Annual Report of the Board of Supervisors of the Vernon County, Wis., Soil Conservation District.

Just recently a Vernon County farm youth, Carlyle Skolas, home on Christmas furlough, stopped at the Vernon County Soil Conservation District office and asked that his soil-conservation plan be placed in practice on his farm. "I won't be home again for possibly a couple of years, and when I return I want to see our plan in practice on the farm. Help my dad and see that all soil-conservation measures are put in practice on the farm," said this young man. Many other farm boys have the same attitude. These boys are fighting to preserve your freedom. Parents, arm yourselves to defend your and their farms. This is a challenge—can you accept it?

A county soil-conservation district was formed by your county board because it felt the need for soil-conservation measures in the county. The district staff will gladly assist you in building defenses against soil and water losses on your farms.

Your boys will be returning at the end of the war to operate these "home farms." Let's hope they need not ask the question—"Well dad, here's the farm, but where's the soil?"

With the soil of our great country meaning as much to the boys in our armed forces as these two incidents indicate, it is the duty of all of us at home to do our utmost to preserve it for them when they return, at least for those who do return.

A DAUGHTER WRITES ABOUT HER DAD

Next month, a girl named Gwen tells our readers what soil conservation has meant to a 300-acre dry farm in Whites Valley. Her father is a member of the board of supervisors of the Northern Utah Soil Conservation District. Gwen calls her article, "Dad Preaches Conservation."

PLOWLESS FARMING

BY ARNOLD G. INGHAM

DURING THE LAST 12 years we have worn out only one plowpoint. Most of that wear was in the three gardens and in some contour plowing in the pastures. Since giving up "farming" we have cut our overhead expenses over 50 percent and have eliminated all the gullies and galls that had earned for our place the reputation of being the poorest farm in the county. It is years since we have bought any hay. Our purchases of high protein feeds have been cut in half. Our cattle are bigger, and they produce 40 percent more milk with 40 percent less labor.

When we put our best land in corn every year we had that much less land in pasture. As a result, we had to buy more high-protein feed to balance the low-protein corn. We also had to feed hay in the summer because we were short of pasture, with the result that we ran short of hay in the winter, and had to buy hay to feed our cattle until our poor pastures could help out. What lime we could afford to buy went on the hayfield, and most of the manure and fertilizer went on the cornland. We plowed on the contour, hauled every bit of manure out daily direct to the fields, and bedded everything heavily with litter from the woods—wonderful crops of corn and alfalfa ensued, but the net profits were very small. It was all we could do to meet the modest payments due to the Federal Land Bank, and other creditors had their patience severely tested.

We struggled along until the record-breaking drought of 1930, which left us in the red to the tune of over $1,600. The Federal Land Bank was worried, too, but let us hang on. We bought hay and feed and carried all our labor and their families through that winter, and came into 1931 with great hopes.

We got 25 acres ready for corn that year. One thing about a real dry year is the fact that plant food is conserved because there is not enough rain to wash it away as fast as it becomes available. This is why irrigated land in arid countries gives such wonderful results. This was the effect that we got in 1931. Everything started off beautifully. The corn grew nicely, and the grains and weeds in the corn also grew—plenty of crabgrass seeds had not sprouted the year before. This made us give that corn extra working. It seemed, however, that every time we cultivated the corn we got a heavy rain right afterward. This made the corn grow

This fire lane was cut through woodland and seeded to pasture grasses by Mr. Ingham. Grazing serves to maintain the lane as an effective fire-break.

nicely, but the sad part of it was that a lot of topsoil washed away at the same time. After the corn was put into the silo (and a man from Iowa who helped put it in said he never saw more good corn go into a silo), we took a good look at the field. It was a mass of gullies 2 to 10 inches deep. It did not require an expert to figure that more plant food was washed away than had been taken up by the corn crop. The value of the lost topsoil was beyond calculation. It takes nature 400 years to make 1 inch of topsoil, and ours had been washing away for over a hundred years, so, although we had made a good crop and had eased the Land Bank situation, we figured we had done it by overdrawing on the Bank of Fertility. The working capital of that bank was provided by the Founder, and is the chief wealth of the State. The farmer is really only a trustee; he has no right to rob the bank and abscond, as he has been doing for generations. The result is the great rural slums we see from the Potomac to the Okmulgee.

We figured that if that land had been in a good stand of grass there would have been little or no soil erosion. Our cows could have cut the crop and got just as many units of digestible nutrients from it, while returning most of the plant food. So we got seed catalogs and bulletins and bought and planted a lot of pasture grass and clover seeds.

The result was nothing to brag about. The herdsgrass did very well but the orchard grass, bluegrass, and clovers failed to produce results as promised. We had to buy more hay than ever, as our alfalfa was playing out.

Then came J. C. McGuire, an apostle of Korean lespedeza. This was to be the salvation of the poor

Contrast between treated and untreated pasture similar to conditions found on the Ingham farm. An excellent stand of orchard grass, white Dutch clover (ladino clover in low, moist spots), lespedeza, and red top (herd's-grass) is coming in.

man on poor land. This was the crop which would grow on poor, worn-out land, which needed no lime or fertilizer, which made good hay and grazing, and which reseeded itself. We tried it and it turned out just like McGuire said. All we had to do was to sow Korean lespedeza anywhere and we got all the hay and grazing we wanted, as long as the lespedeza was growing. It did not get started until June and it quit at the first frost but it really gave results and saved us from buying hay any more and let us sell our corn planter and cultivator. The "relief men" came and hired our help, and our team stayed in the pasture all the time it used to work in the fields.

In a few years broomstraw choked out most of our lespedeza. We had to get to work and mow broomstraw so as to give "deza" a fighting chance. It was no go. Mowing gave good results but did not seem to worry broomstraw to death. We knew that the old trick of burning off the broomstraw was suicide and would kill what grass we did have and only make the broomstraw more of a pest. Then we heard Dr. "Tom" Hutchenson talk on pasture fertilization and also give "deza" a lot of debunking. It seemed that Korean lespedeza could not really do all those things that it appeared to do. It really was a scavenger crop and lived off what other crops could not exist on and when its meagre diet was used up it died out and really left us worse off than ever. What we had to do, according to Dr. Hutchenson, was to feed our land the elements of plant food that it lacked to make real pasture grass and alfalfa grow. Bonanza farming was not permanent agriculture, whether we took away plant food with corn and alfalfa or cleaned up the scraps with lespedeza. But that broomstraw had us licked. Then we heard a man ask Dave Painter at a meeting how we could grow grass in Eastern Virginia when the broomstraw always choked it out in about 2 years. "Broomstraw never choked out any grass," said Mr. Painter. "What happened was that the grass used up all the available plant food and then died. Then, thank Heaven, broomstraw came up and held your land together." That was a revolutionary idea and certainly sounded just as amazing as what Mr. McGuire had claimed about lespedeza.

This farming game is deep. Did we have to keep on feeding the land forever to make grass and alfalfa grow? Had our predecessors robbed the Bank of Fertility and left us with the job of putting up new capital? There was no more virgin land out West. Our topsoil had gone down the river but we could not go over the mountain as our forefathers used to do. The Western man's land was blowing away in duststorms—we could not look to him for our hay and grain as in former days. We definitely were not going back to corn. Our land was not washing away any more. We heard of people who had gone in for pasture fertilization and had cut down the cost of producing milk and raising cattle. Figures from the Department of Agriculture showed that the average dairy farmer spent 50 times as much for feed as he did for lime and fertilizer, but that the most successful dairy farmers spent nearly half as much for fertilizer as they did for feed. They also showed that cows on grass produced better and cheaper milk than cows fed in a barn. They also showed that young cattle raised on good pasture grew bigger and healthier and much cheaper than young cattle raised on hay and grain.

In the last 7 years we have used over 1,000 tons of limestone on 140 acres of grass and hayland. We have used over 200 tons of fertilizer. Bluegrass is choking out the broomstraw. Our entire herd is living on hay made on land that has not been plowed

Registered Guernseys feeding on a pasture of the Ingham farm—orchard grass, lespedeza, red top, bluegrass, white clover, and red clover. Well developed pasturage, rich in protein, is provided the year round.

for many years. We have the best alfalfa we ever had on land prepared with a disc harrow. We have excellent hay growing on land that has not been plowed for 82 years! We paid off the Federal Land Bank 10 years ahead of time! Last year we put 20 percent of our income into United States war bonds. The old Bank of Fertility is paying dividends and accumulating a surplus.

EDITOR'S NOTE.—The author of the foregoing is a cooperator in the Piedmont Soil Conservation District. He gets his mail at Wellville, Va. He is a topnotch farmer, with a topnotch farmer's contempt for slovenly farm ways. He also is an effective evangel of soil conservation, and a prime teller of stories—usually Scotch.

Mr. Ingham's article, Plowless Farming, which you have just read, was written at the behest of Linwood R. Henderson, of the Soil Conservation Service. Specially wanted, to quote Ingham, was "something from a farmer right off the pitchfork."

That "something" turned out to be this homely-phrased gem logging Mr. Ingham's dramatic progress from tragedy to triumph. It roused instant enthusiasm and, likewise, instant curiosity as to the practical details encountered along the way.

In a few offhand notes jotted down by way of postscript, Mr. Ingham has supplied a number of interesting commentaries having to do with preparation of the land, with seed mixtures, and with soils. We offer these additional remarks, exactly as did he, in the form of afterthoughts.

THE MAIN SOIL TYPES on this farm are Durham and Appling sandy loams, with mostly yellow subsoil. A survey made by the Soil Conservation Service showed that about 50 percent of the original top-soil had been washed away.

The herd consists of registered Guernseys. It was for their maintenance that the land-improving program was started. The herd has been very closely bred for over 60 years and it was imperative that it get optimum feeding conditions to maintain production and insure the vigor of offspring. Good livestock can never be developed on depleted soil. No matter what the inherited ability, livestock cannot function unless properly nourished.

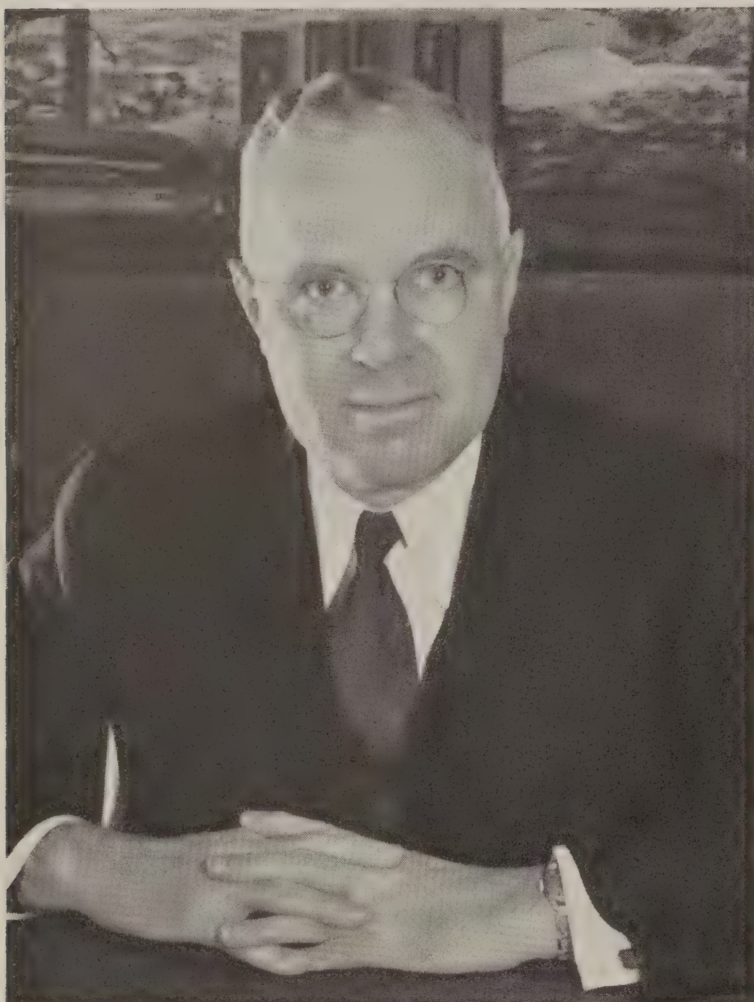
Our system of breeding from our own herd has enabled us to maintain animals free from disease, and from known producing ancestry. No replacements have been bought since the original foundation stock came from New Jersey in 1910. On the other hand, we have been able to supply foundation herd material all over the Southern States. This is in contrast to the average dairy farm in the State of Virginia, which each year buys a large percentage of its cows for replacement purposes. This is a great economic loss. Our dairy farmers ought not only to raise all their own replacements, but also have well-bred cows to sell to the 46,000 farmers in Virginia who do not even have a family cow.

The old cornfields that were sowed in lespedeza were topdressed with limestone, manure, and 20-percent superphosphate. The bluegrass was not sowed; it just came of its own accord. Parts of the pastures were disked in spring or fall, after getting 4 tons of ground limestone over a period 3 to 4 years, and from 1,000 to 1,500 pounds of 20-percent superphosphate during the same period. These areas were seeded with a mixture that contained about 10 pounds of Korean lespedeza, 5 pounds of orchard grass, 2½ pounds of herdsgrass, 2½ pounds of red clover, and 1 pound of Dixie white clover. This was rolled in and then topdressed with manure, taking care not to topdress after the seed had sprouted uutil it had taken good root. The disking cut the broomstraw up but did not eliminate it. The fields were mowed once or twice a year, and the heavy trashy hay on the bottoms was used for bedding. The best hay was fed out of stacks, while the growth on the poorest land was left for mulch. Most of the material mowed off pastures that had much grazing was left on the land as mulch. This should be done to assist the growth of bluegrass and help to absorb the water.

Excellent stands of alfalfa have been obtained by disking land that has been topdressed with limestone, manure, fertilizer containing 12 percent phosphoric acid, 12 percent potash, and 40 pounds borax to the ton. On land that has not been in alfalfa we used a mixture of clovers and grasses with 10 to 12 pounds of inoculated alfalfa seed. On a small field seeded in August 1942 the best results were on gullies that had been filled up with dirt dug out to make a fish pond. Previous to being disked this land was in broomstraw waist high and had not been plowed for over 80 years. The alfalfa, clovers, and grasses are not expected to last long but when they show signs of dying out the land will be seeded with Korean lespedeza and lespedeza sericia broadcast late in February, with no preparation other

(*Continued on page 45*)

LOOKING FORWARD TO A BETTER WORLD



BY R. M. EVANS

ONE OF THE REMARKABLE things about the recent United Nations Conference on Food and Agriculture, it seems to me, is that it studied the agricultural problems of the world. There have been many conferences in the past, attended by representatives from a great number of countries, to study financial or business problems but this is the first time a conference of this magnitude has been convened solely for the purpose of looking at the problems of agriculture.

Another remarkable thing about the United Nations Conference on Food and Agriculture was its sheer size. There were delegates from 44 countries. That gives some indication of the seriousness with which farmers in all parts of the world are thinking about their business.

The third remarkable thing—and maybe this is the most remarkable of all—was the evident desire of these people from all over the earth to cooperate with one another for the best interests of all. They not only were cooperating at the conference, they were looking forward to a better world after this war is won.

EDITOR'S NOTE.—The author, former head of the Agricultural Adjustment Administration, is member of the Board of Governors of the Federal Reserve System, Washington, D. C.

I THINK most American farmers would be interested in the food problems people are facing in some of the war-torn countries. After talking with the delegates from Great Britain, for example, I came to appreciate more than ever how important food is in the prosecution of the war. Food produced by our farmers has enabled the British to give their workers in the war industries a better diet than otherwise would have been possible, and this in turn has enabled them to increase their production of war materials very greatly. This is a war of machines in which an army without plenty of tanks and planes and guns is helpless. If, as a result of our supplying Great Britain with extra foods, they can step up their production of planes, it means that there are just so many more planes available for instant service—planes that do not have to be manufactured in this country and transported across the sea.

In China and many of the other occupied countries the need for food enough to keep body and soul in the same suit of clothes is critically urgent. Lack of food has handicapped their war effort, and it will also handicap their post-war reconstruction because the Chinese people may not be strong enough physically to do all the work that needs to be done.

In Russia farmlands have been devastated in huge areas—buildings have been burned, tractors and farm machinery stolen and taken away, and even men and women who formerly tilled the soil have been removed to Germany to work in Nazi war industries. Russia, in the post-war period, will have a tremendous task just to restore the ravaged farmlands and get back into food production.

THE INTERESTS OF CONSUMERS bulked large in the thinking of the delegates to the Hot Springs conference. Consumers are the customers of agriculture. We all, of course, want them to be supplied with an abundance of food of good quality at reasonable prices. In the period after the war there is going to be a scramble for food of any kind. The production schedule will call for farmers growing cereals and other products that can be utilized quickly as food, rather than concentrating on the rebuilding of herds and flocks. The latter is the long-time objective, however, and nations will move in that direction as soon as immediate needs have been filled.

There was a feeling among the delegates that some way must be found for nations to assume more responsibility in providing children with a well-balanced diet so that they can grow up into physically and mentally well equipped citizens. Today scientists know a great deal more about nutrition than formerly, and I believe nations as a whole are taking a more enlightened view regarding the nutritional needs of their citizens. Certainly over the years ahead it will be in the best interests of every nation to keep healthy its people, especially young people and mothers. Ultimate advantages, due to increased

working capacity—and less sickness—should be very great. A healthy nation means less-crowded hospitals and less need to care for people at public expense.

I FIND THAT MANY of the farmers abroad are worrying about some of the same problems that plague us in this country. They realize their soil is being depleted because of the heavy drain due to intensive cultivation for the war, and they know it must be rebuilt if it is to produce rewardingly. They are thinking more and more about soil conservation measures, and they are generally agreed that the farmers of the world should exchange knowledge and experience with one another. Probably some countries will want to exchange trained experts, especially those who have had broad experience with soil conservation. Our farmers will thus derive benefits from conservation ideas developed outside this country. Undoubtedly much is to be gained by this kind of mutual help.

I think the greatest cause for concern among our farmers is expressed by the question: What are our markets going to be after the immediate needs of war-torn nations have been met in the post-war period? And, especially, what are these markets going to be for the crops that are produced in surplus in this country? We have been in the habit of exporting a fair percentage of our agricultural production in normal years, and we are interested in seeing that world markets remain open.

Farmers in other parts of the world have similar problems with some of their crops. I think it likely that these countries will try to work out programs similar to that of the International Wheat Agreement, which attempts to assure consumers an adequate supply at all times and still give producers a reasonable return for their labor and investment. This is something worth working for, and we must all work together to do the job which I think must be done. No nation can do it alone.

LOOKING AT THE CONFERENCE strictly from the standpoint of the American farmer, it seems to me it sets a pattern from which we have much to gain. Certainly we can agree that the land should be farmed in such a way as to build up fertility and so maintain productivity at a high level. Certainly we can agree that it is good farming to increase the production of poultry, dairy, and meat products, provided we can have markets that will consume them.

One of the best markets for these and other products in this country is going to be that created by giving all groups an adequate, well-balanced diet, and raising living standards so more people can have the clothing and the scores of other things needed to make a better life. Now that employment is at a very high level and the income of all the people is relatively high, we find that their ability to consume our increased production of meat, poultry, dairy products, and other agricultural crops is very greatly expanded. If we could have full employment in the post-war period we would have the greatest market we have ever had for the products that naturally result from a sound soil conservation type of farming—greater even than it is in this wartime period.

OBVIOUSLY, BOTH THE EMPLOYMENT and the health of the peoples of the different nations depend on the soil. Bodies are really built from the ground up; therefore, in planning a food program for the nation and for the world, proper attention must be paid to improving and safeguarding the soil which, after all, is the source of our food. Appropriate soil conservation practices not only save the topsoil but insure immediate and continuing increases in crop yields.

I am assured, for example, that in the Estencia Valley of New Mexico, where rainfall is limited, contour farming supported by terraces produced 47.3 percent more beans for a 4-year period, 1936 to 1939,

The oat yield on the untreated *topsoil*, at left, was four times that on the untreated *subsoil*.

than did similar fields that were unterraced and farmed in straight rows.

Similarly, the yields of wheat on nearly 200 fields in the Southern Great Plains were 31.3 percent greater where the land was terraced and contoured.

Corn on contour listed land for a 6-year period at Clarinda, Iowa, averaged 12 bushels more per acre than adjacent land that was listed up and down the slope. In 1941 the yield of corn on half of 19 rolling Iowa fields that were contour farmed averaged 11.3 bushels more per acre than on the other half of the same fields where contour farming was not practiced. Last year (1942) was a good corn year and rainfall in Iowa was thought to be ample, yet the average yield of corn for 30 contoured fields was 6.2 bushels per acre greater than the yield on the noncontoured portion of the same fields. The yield of soybeans for 30 contoured fields in Iowa last year averaged 3.3 bushels greater where the land was contour farmed.

Extensive experiments throughout the Corn Belt show that corn grown in a good rotation, including a legume, can be expected to yield at least 25 percent more than where corn is kept on the land year after year. In the Southeast, the increased yield of corn or cotton grown in a good rotation can be expected to be from 50 to 100 percent more than when either crop is grown continuously.

Data on crop yields in the Northeast indicate that the practice of crop rotations in connection with the production of truck crops will increase the yields from one-fifth to one-third.

The use of commercial fertilizers and manure in conjunction with good crop rotations at widely different locations in the United States has produced increased crop yields ranging from 10 percent to 400 percent. In some areas the effectiveness of fertilizers and manure is limited by lack of sufficient moisture, but in various other localities results indicate that an average of at least 20 percent increase in yield can be expected from application of adaptable fertilizers.

The data all show that best results are to be obtained by adopting soil-conservation farming before the fertile topsoil is washed away. In the absence of soil-conservation farming, a good many fields may lose topsoil at the rate of an inch in 1 to 5 years. It has been shown that corn, soybeans and other cultivated crops yield in proportion to the depth of the topsoil that remains. For the Corn Belt it has been shown that on some important types of farm land a decline of 5 bushels of corn per acre occurs for each inch of topsoil that is lost.

I think it is comforting for the American farmer to realize that business and industry are giving markets and soil conservation and nutrition most careful attention, and that their leaders are working together to bring about conditions that will insure full employment in the post-war world. The same idea came up again and again at this conference—only it was on a world scale instead of simply a national scale. Certainly agriculture and people generally have a great deal to gain if this movement is successful in our country and in other countries.

I am encouraged to believe that this conference will result in a permanent world organization devoted to bringing about a sound, conservation type of farming and ever-expanding markets for the products of such farming through improved nutrition and higher levels of living in all countries. The farm programs we have spent so many years in developing will naturally fit into this general pattern, and they will continue in the future as they have in the past to give the American farmer his fair share of an expanded national income.

BETTER SEED OR BETTER SOIL

BY W. A. ALBRECHT

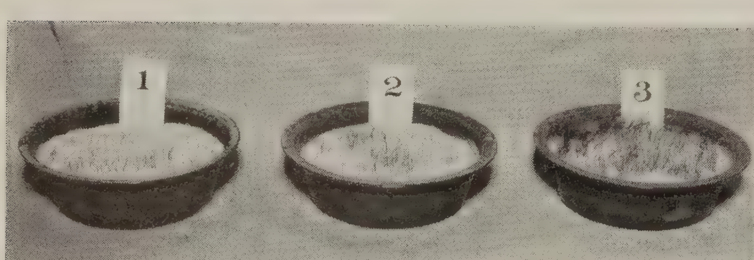


Figure 1.—The bluegrass stand improved according to the lime delivered to it by the soil, notwithstanding plenty of all other nutrients. (White sand top dressing was used to facilitate photographing.)

THE SIZE of the harvest is the measure of the productive capacity of the soil. Such capacity can be no larger than that permitted by the soil fertility. But harvest time is already too late to help the yield of that crop revealing the deficiencies that were a handicap during its growth, or even in the earlier process of germination. That shortages in soil fertility or in plant nutrients in the soil—particularly of lime or calcium—should show up in the very beginning of the plant's life, and should be responsible for poor germination and defective stand even in grass crops is not widely appreciated.

Grass seedings may be costly through wastage of seed and loss of stand, according to some work by Dr. E. R. Graham at the College of Agriculture of the University of Missouri. By using three different lots of soil that had been carefully prepared to deliver three different amounts of calcium or lime, he demonstrated a heavier stand of bluegrass from the

Editor's Note.—The author is chairman of the Department of Soils, University of Missouri.

same rate of seeding as the soil supplied the embryo plants with more life. This is illustrated in figure 1.

These soils, in all three pans, had been provided with the same amount of all fertility needs other than lime when they had first been planted to soybeans. The entire bean crop, roots and tops, had been analyzed. In this way the lime delivery from soil to crop was measured. Pan No. 1 supplied 16 units of lime to the soybeans; pan No. 2 provided them with 42; and the third pan with 112. These figures represent the lime this legume obtained from these soils to make the differences in growth shown in figure 2.

We have commonly blamed the lime shortage in the soil, or soil sourness, for poor stands of legumes. We have been liming to keep from wasting costly legume seeds. When 8 pounds of clover seed, at $9 a bushel, are thrown away in stand failure, to mean the loss of $1.20 per acre, we do not appreciate the fact that this would need to occur but twice to pay for liming that failing acre with almost 2 tons of limestone. It need occur only once to cover the cost of drilling about a half-ton of limestone per acre as one drills fertilizers. Lime put into the soil in late winter in this manner can do much to supply the calcium needed to improve germination, to thicken the common stand, and to get the crop off to a good start. Grasses, as well as legumes, are now demonstrating the same possibility.

That it doesn't take much lime within the plants to make the crop difference can be judged from the soybeans in figure 2. A ton of crop No. 1 would take from the soil the equivalent of 80 pounds of limestone. It takes only about two-thirds more limestone inside the crop to duplicate No. 2. By making sure that the crop can get about three times as much limestone out of the soil per ton of this forage we can get a crop like No. 3. Fifty percent more tonnage per acre in No. 2, and over 115 percent more crop yield in No. 3 are the results of giving the soybean a chance at no more than 300 pounds of limestone put into the crop. This happened because of the lime, and not because of the liberal but constant amount of other fertilizers.

Perhaps we shall eventually believe that liming the soil is more a matter of giving the crop its calcium than one of fighting soil acidity. When we do, we shall not only use the limestone broadcast in heavy dosage to cover our neglect of the soil during the past, but we shall drill limestone regularly to meet the recurring needs, as we do any other fertilizer.

Bluegrass seedings are already here with their sad tales of stand failures. When these more numerous crop failures with reduced seed production shove seed prices up, as clover failures have done, then we will either lime the soil, or search for a substitute crop for bluegrass. By that time, however, we may have enough knowledge about the chemical composition of the crop, and enough appreciation of its variable value as animal feed, in terms of variable soil fertility producing it, that we will not accept the crop substitute, but will treat the soil instead.

Figure 2.—Soybean crops register the lime-delivering power of the soil and suggest the possible bluegrass stand to follow.

Dr. Graham's demonstration that a stand of bluegrass is in proportion to the lime delivery by the soil, in spite of the fact that all other nutrients were amply supplied, suggests that lime is the foundation on which to base the help by other fertilizers. He has called attention forcefully to the fact that if we are to use our investment in fertilizers and seed for good returns on soils like many of those in Missouri, we must make certain that those soils first have, and can deliver, the calcium needed by the crop. How much seed can be saved, and how much more profitable the use of fertilizers can be when the lime needs of the soil are supplied may be one of the revelations of the future. At present such attention to the soil bids fair to result in (*a*) stand improvement even in bluegrass, (*b*) tonnage increase in forage harvest, and (*c*) greater feeding value of crops that must be garnished through the help of animal machinery and converted into cash via the milk pail or the butcher block.

PLOWLESS FARMING

(*Continued from page 41*)

than another topdressing with limestone, manure, and alfalfa fertilizer. This field is far from the farms and not in the regular alfalfa setup.

Our gross income is over $300 a year per cow, but when we quit growing corn many farmers said that we had quit farming. We had to quit or our farm would have joined the Navy in Hampton Roads!

CHIEF BROADCASTS TO SOUTH AFRICA

RESPONDING to an invitation from the Overseas Branch of the Office of War Information, Dr. Hugh H. Bennett, Chief of the Soil Conservation Service, has recorded five talks on soil conservation for short waving to South African farmers.

Soil conservation is one of the timeliest and most important subjects in the world to South African farmers, OWI reports, and vigorous and progressive measures are under way there to combat erosion. It was Prime Minister Jan Christian Smuts of the Union of South Africa who declared not long ago that "erosion is the biggest problem confronting the country, bigger than any politics."

In his talks, Dr. Bennett pointed out many parallels in erosion-control practices in the United States and South Africa. He paid his respects to Colin Maher, Kenya Colony conservationist, who visited the United States several years ago to study soil-conservation methods and later write an extensive report on his observations. In addition to pointing out the scarcity of productive land in the world and the need of conserving what we have, Dr. Bennett stressed the importance of soil conservation as a factor in international good will and understanding. "It will lead in the direction of world peace probably more than any other activity of mankind," he said.

Other highlights of the South African talks follow:

Only about 11 percent of the earth's total land area, whether it be in the hands of our enemies or our friends, is capable of cultivation now or in the immediate future. This relatively small fragment of earth is all the human family can draw upon. At present, the other 89 percent cannot furnish man with the necessities of life . . . Today the world faces a scarcity of productive soil. Some 2 billion people depend for sustenance on only 4 billion acres.

Our best estimates of the land situation indicate that from two-thirds to three-fourths of world's available croplands are subject to erosion. Of this, at least two-thirds already has been damaged because of such wasteful practices as up-and-down hill farming, continuous use of soil for a single exhausting crop, or cultivation of steep land that should be used only for grass or trees.

Conservation farming is the equivalent of finding new cropland. Every five farms where conservation is completely installed are now producing the normal output of six untreated farms. Efficiency in farming means not only the elimination of waste but expansion of producing capacity.

The total cropland now available to the existing world population is barely enough to supply a minimum diet. It is not enough to provide an adequate diet.

Soil conservation is not the private concern of any one nation nor of any one group of people. Soil conservation is the concern of all nations, and of every citizen in every country. The future of all nations, in the last analysis, depends on how we use and care for the croplands of the world . . .

Soil conservation is not a passive science, something that is to be applied only when there are signs of danger. For then it is too late. Soil conservation must be an ever-watchful sentry responsible for the safety of the source of food production for the world, now and for all time.

Soil conservation becomes the basic link between nations for the betterment of people as a whole. It is a constructive force for binding together land users within community areas, and for building international good will and understanding. It will lead in the direction of world peace probably more than any other activity of mankind. We might very well recall this, then, when we come to reflect upon the fact that now, 1,943 years after the birth of Christ, we have on our hands the most terrible of all the long history of wars. Something has failed somewhere. It may be that our costly failures across the centuries might have been avoided or minimized through international cooperation in matters pertaining to that kind of good land use which produces more food for people everywhere.

I wish it were possible for us to compare notes occasionally on the work we are doing. An exchange of ideas is always helpful, especially, from nation to nation. Soil conservation may yet become one of the best unifying bridges between nations of the world. The conservation programs of South Africa and the United States are typical of work that strengthens international friendships and brings closer the day of real and lasting peace.

—Emil Corwin.

WAYSIDE TEACHING

J. C. Owens, work unit leader in the Limestone Valley soil conservation district in Georgia, believes in adapting educational meetings to the situation.

One day during the late winter when it was raining, he was passing a crossroads store and stopped in to buy a package of cigarettes. He found the owner of the store and several farmers discussing the AAA program and soil-conservation practices, and he joined in the conversation.

Mr. Owens had a projector and some slides in his pick-up and he asked permission of the owner of the store to show the slides in order to illustrate methods of establishing the practices they were discussing. With the rain pattering down and no prospect of getting any work done anyhow, all agreed this was an excellent idea.

Mr. Owens spent an hour and a half showing the slides and discussing the various practices with the farmers. As a result of the discussion, six of the eight farmers present made application to the district for assistance in developing conservation plans for their farms.

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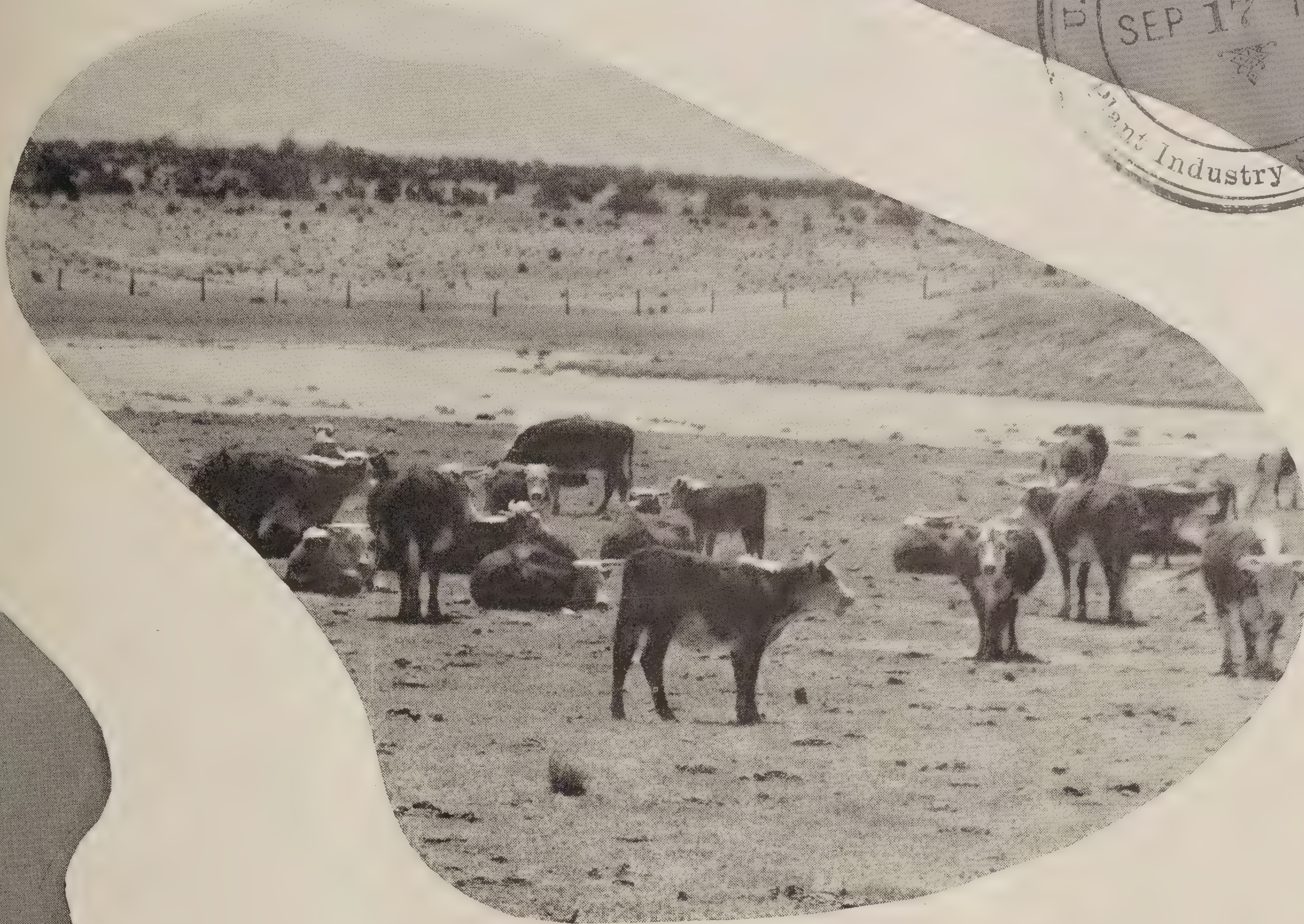
This war poster of timely appeal brings to focus the great importance of farm-woods production stressed by A. E. Fivaz in his article in this issue.



September 1943

SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

Contents

WELLINGTON BRINK
EDITOR

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SOIL CONSERVATION

CLAUDE R. WICKARD
SECRETARY OF AGRICULTURE

HUGH H. BENNETT
CHIEF, SOIL CONSERVATION SERVICE

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Oats and vetch mixture, seeded in cotton middles after the first picking of cotton, in Gibson County, Tenn. Here is excellent fall and winter grazing that can be utilized without damage to the subsequent grain crop.

PASTURING FALL PLANTED GRAINS

By C. R. ENLOW

LIVESTOCK NUMBERS are at an all-time high. This seems quite logical because the demand for livestock products is tremendous. We must keep our men at the front supplied with meat, cheese, and other products. We must ship large quantities to our allies and at the same time provide sufficient food so that we ourselves can do our best in helping to win the war.

Perhaps never before has there been such keen interest in the condition of the growing crops. When one recalls that our reserve supplies of grain are dwindling, concentrates are scarce, and that there is little or no hay in sight except the growing crop, it is not surprising that we are all concerned about the condition of crops. Pasture, likewise, has suffered because of the expansion in the acreage of corn, soybeans, hemp, flax, and other crops, considerable of which has come through plowing up pasture.

WHAT can we do at this time to avert possible feed shortages? Certainly we cannot sit back and hope everything works out as it should. This is the type of attitude that will most certainly bring success to the Axis.

EDITOR'S NOTE.—The author is Chief, Agronomy Division, Soil Conservation Service, Washington, D. C.

We all realize that the feared shortage of grass and legume seed is rapidly materializing into an actuality and we must use our efforts to encourage farmers to seed an extensive acreage of winter cover crops in order to provide needed seed supplies and also additional fall, winter, and spring grazing. Certainly the supply of winter legume seeds will not go very far. If you figure the seed-production prospects for this year, including a large carry-over from last fall which arrived in the South too late for planting, there are approximately 327,000,000 pounds of Austrian winter peas, vetches, rye grass, and crimson clover in sight. But at that, it would not be enough seed to plant the cropland in the States of Alabama and Georgia.

Fall grains—rye, wheat, barley, and oats—play a bigger part in the conservation and food-production program than most of us realize. A tremendous acreage is seeded each fall. Most of the seedings are made with the idea of harvesting a grain crop next summer. More thought should be given to utilizing the seedings for fall and winter grazing—and to seeding additional acreages primarily for the purpose of grazing. It is the purpose of this article to urge that all possible emphasis be placed on seeding fall grain, not necessarily for grain production, but to insure more livestock feed in the form of pasture and at the same time protect exposed soil from erosion.

In the Winter Wheat Belt it is quite customary to graze wheat in the fall and winter with livestock, provided it makes sufficient growth to justify grazing. Unless it is overgrazed, no reduction in grain yield is to be expected the following summer. Quite frequently 6 weeks' to 2 months' grazing can be obtained in the fall and early winter, and with ideal conditions considerable grazing is obtained through the winter months. It has been found, however, that spring grazing is liable to reduce grain yields rather seriously, and during the spring months livestock should be kept off grain that is to be harvested.

Recognition of the value of wheat, barley, oats, and rye for grazing is universal. In building up pasture calendars for year-around grazing, considerable reliance is placed on the cereals throughout the country. There are a few of the State experiment stations that have made a study of the grazing possibilities of fall-planted grain. Texas, for instance, has done considerable work and found it is possible by utilizing winter grain along with native pasture and Sudan grass to get year-around grazing. Lately the Texas station has been studying the forage production of different varieties of winter grains by frequent mowing, and is finding a tremendous difference in the production of different varieties. So much so, in fact, that it is evident from the standpoint of t use of cereals for grazing for increased production livestock products that similar studies should be co ducted in other sections of the country.

Connecticut points out that barley or oats can seeded in late July or August and pastured from Se tember to November 15, thereby getting from 75 to 1 days of grazing. New Jersey recommends barley a pasture crop for either fall or spring grazing, plar ing it a few weeks earlier in the fall in order to g additional growth.

Tennessee advocates winter grains for grazing, a both the middle and west Tennessee experiment st tions have carried on limited experimental work. the middle Tennessee station, calves grazed rye f 156 days and gained 122 pounds each. At the sa station, sheep grazed barley pasture during the wint and spring for 165 days. In North Carolina, barl seeded around August 25 furnished 81 cow-da grazing per acre as an average for 3 years, and y the barley produced 34 bushels of grain per ac Other States have experimented with winter grai for pasture, and have published information concer ing their use for this purpose.

Missouri has for many years been carrying on 1-year rotation of lespedeza and winter grain as basis of her livestock program. In 1941 there we 105,066 farms growing lespedeza in Missouri. Fort two percent of these farms were regularly using t annual rotation of small grain and lespedeza. It not possible to assume that all of the winter grain grazed, but certainly much of it is. A very profital return can be obtained by fall and winter grazi without reducing the yield of grain. In the case many livestock farms, the grain is grazed in t spring until the lespedeza takes over. The type management depends on the type of farming th is carried on and the needs of the particular farme

This summer and fall there will be tremendo acreage of corn, soybeans, cotton, peanuts, hen flax, potatoes, lespedeza, and other crops harvest Undoubtedly a great deal of this land will be seed to fall grain and farmers will have plans for t use of the remainder next year for other crops. N much effort needs be expended in case of the plann seeding except perhaps to encourage farmers to se sufficiently early to get enough fall growth for gr ing; at the same time, however, it is important follow State recommendations concerning time seeding, in order to prevent an infestation of H sian fly or other insects and diseases. Acres th would otherwise remain bare all winter, howev should be seeded, and this is where we can dev

(Continued on page 68)

TILLAGE FOR GRASSHOPPER CONTROL

By GERALD B. SPAWN and M. S. McMURTREY

ERHAPS THE GREATEST threats to food :oduction in large areas of the Northern Great lains, aside from possible moisture shortages, 'e grasshoppers and wind erosion. Experiences ıus far have indicated that subsurface tillage, hich has succeeded in controlling wind erosion those areas, also will give a reasonable degree grasshopper control.

This is what happens to potato plants.

Damage to corn.

HESE TRENDS are revealed in an experiment hich was begun in the fall of 1939 by the Entoology Section of the South Dakota Agricultural xperiment Station in cooperation with the Soil nservation Service, the senior author being in arge of the project.

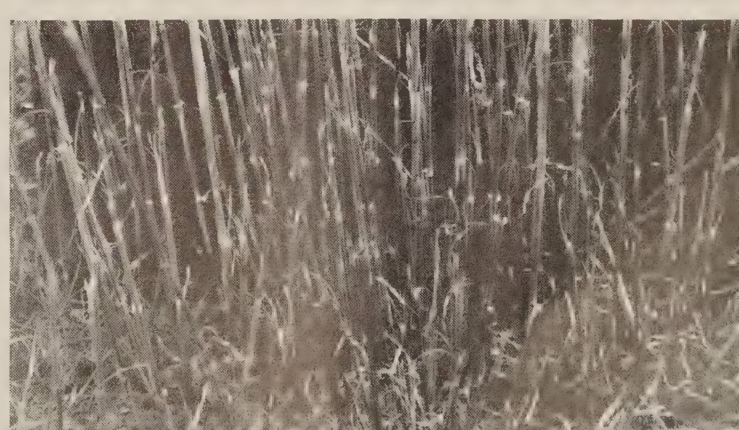
The grasshopper plague is not new and efforts to ntrol it have been sought for years. Reports of ore than three-quarters of a century ago told of freent locust plagues. The one in 1874 was conered the worst, although in terms of dollars and nts the damage was probably less than the more ent infestations. This is because of the growth in pulation and increase of cash-crop production.

Now, however, the farmers are confronted with asshopper control, not only from the standpoint protecting their own interests, but also to help oduce food for war. Grasshopper control is a triotic necessity for every farmer, because the asshoppers are a serious saboteur to the Nation's r work. There are very few, if any, crops not langered by them. The pictures showing several our essential war crops bear silent testimony to seriousness of ravage by hungry hordes of grassppers whose appetites seem never to be satisfied.

The emphasis being given to conservation of the soil brought about the realization that grasshoppers are far more than just a serious menace to growing vegetation. In areas where grasshoppers appear in outbreak numbers they are, through the destruction of growing plants, very definitely one of the major hazards of the soil itself.

Without cover, the soil of the Great Plains is subject to devastating erosion by wind. Drought, improper tillage, cropping practices not in accord with the capabilities of the land, and grasshoppers are the most important factors causing lack of cover.

Many fields, particularly corn, have been completely denuded of vegetative cover as a result of grasshopper invasions. Small grain fields, especially if planted late in the spring or of a late maturing variety, have suffered similar fates although usually not to the extent of complete removal of cover. Grasshoppers also attack grass, thereby thwarting attempts to regrass badly blown areas and seriously damaged ranges. Thus, grasshoppers are recognized as one of the major obstacles to successful farming, soil conservation, and range and pasture management.



Barley defoliated by 'hoppers, mostly nymphs. In the end, few stalks are left and the field becomes a mat of Russian thistles.

DITOR'S NOTE.—The authors are the Assistant Station Entomolo- South Dakota Agricultural Experiment Station, Entomology ion, Brookings, S. Dak., and the Chief, Regional Biology Division, Conservation Service, Lincoln, Nebr., respectively.

Grasshoppers remove leaves before starting on stalks.

Cooperation in control measures is essential because under certain conditions, grasshoppers will move from one farm to another. However, this important fact remains: The damage should be decreased for an individual farmer in proportion to the reduction of grasshoppers on his own land. This statement will hold true insofar as the grasshoppers that do the damage to small grain crops are usually locally produced from the margins or headlands and the edge of the field in a strip some 150 feet wide. The width of the grasshopper-producing strip around the edge of a field may vary considerably. In the case of the lesser migratory locust the eggs may be deposited over the entire field. As a rule, by the time grasshoppers start to migrate or drift by flight into other areas the small grain cr has been harvested.

Certain tillage practices used by farmers, if do at the right time, comprise one of the most importa means of reducing grasshopper populations. Th practices should be followed up the next spring careful surveys of the fields at the time the young a hatching, for it may be necessary to follow the ti age practices by the timely use of poison bait in or to obtain the best results.

Tillage methods bring about destruction of t eggs in several ways. One of the principal objecti in the use of tillage for grasshopper control is t stirring up of the surface 2-inch layer of soil (th in which the eggs are deposited) so that the egg po will be broken and the eggs exposed. This will all the eggs to dry out to such an extent that they dinarily will not hatch. Such treatment also mak the eggs more readily available to predators (oth insects, mites, rodents, birds, etc.). The tillage ope tion alone causes a certain amount of actual m chanical destruction of the eggs.

Fall tillage is recommended in preference to spri tillage, so that parasites, rodents, birds, weather, e are given a longer period of time to complete the struction of a large percentage of the eggs. Leavi the eggs in the disturbed soil to pass through t critical winter season will alone decrease the hatc ability of a large number of egg pods. It facilita the drying out of egg pods, and also makes them su ject to the effects of alternately freezing and thawi temperatures. Where crops or weather conditio prevent fall tillage, spring tillage for control of lo grasshoppers is recommended. Deep plowing (mo board) is a good method to use where it is acco panied by proper safeguards for protection agai soil loss by wind or water erosion. Deep plowi serves to bury the eggs to such a depth that hatchi if it occurs at all, is greatly delayed, and most of t hoppers that do hatch die before reaching t surface.

RESULTS OF EXPERIMENTAL TESTS

The South Dakota Station tillage project for gra hopper control was started in the fall of 1939. T results presented in the following charts are ba upon tillage tests conducted over a period of 3 yea Tests are still being conducted and final tabulati may present conclusions somewhat different fr those given below.

In some cases certain practices, which were practical for use in the immediate areas in quest or for which implements were unavailable u recently, were given but a single test. These indicated in the tables as tests for 1 year only.

EXPERIMENTS IN THE WINNER-RELIANCE AREA

Soil Type—Clay Loam

[Fall tillage—Field conditions]

llage method:	*Average percentage control*
Moldboard plowing	83.50
Double disking	74.10
Single disking	58.76
1-way disking (wheat land plow)	54.76
Subsurface cultivation (straight blade type)	50.00
Subsurface cultivation (small sweep type or duckfoot)	46.45
Regular listing	40.24
Cut-away disk treatment	35.25

EXPERIMENTS IN THE HECLA AREA

Soil Types—Valentine Sand and Sandy Loam

[Fall tillage—Field conditions]

lage method:	*Average percentage control*
Regular listing (1 year only)	[1] 100.00
Moldboard	94.15
Tandem disking	93.80
1-way disking, plus drilling (1 year only)	93.11
Subsurface cultivation (wide sweep type—1 year only)	90.52
1-way disking (wheat land plow)	86.28
Subsurface cultivation (small sweep type or duckfoot)	81.64
Plowing with moldboard removed	74.01
Double disking (1 year only)	54.44
Single disking	39.34
Subsurface cultivation (straight blade type)	No control

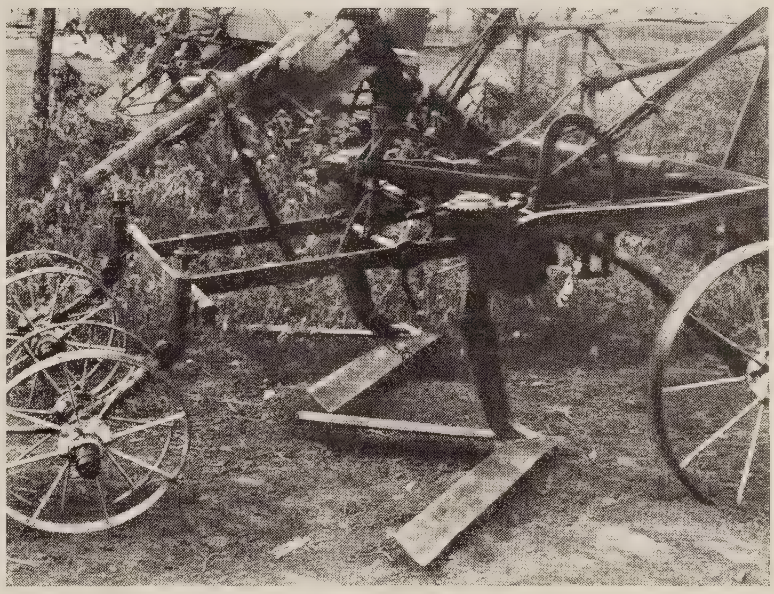
Additional tests would no doubt lower this average.

In addition to destruction of eggs there is still other way in which tillage can be used to advange. This involves the use of tillage implements to ncentrate egg deposition in areas in which the eggs y later be destroyed.

Tests have indicated that subsurface cultivation d other types of treatment used as soon as possible ter harvest, and before the grasshoppers start to y their eggs, will make unfavorable areas for egg ying. The grasshoppers will avoid these areas and ll then concentrate their eggs in the adjacent favorable untilled areas. The latter may then be treated after egg-laying has been completed. In this kind of a control procedure, it is best to leave untilled strips in the field (strips 15 to 20 feet wide) at intervals of about every 20 rods, where the eggs will be deposited. Subsurface tillage soon after harvest is also recommended for weed control as a moisture conservation measure.

This method of forcing concentration of eggs actually has been used to advantage. For example, in one instance, 162 soil samples of one-half square foot each were taken from an untreated strip in a barley stubble where the remainder of the field had been treated by means of a duckfoot cultivator immediately after harvest. These samples showed an average of 3.31 grasshopper egg pods per square foot for the untreated areas. Twenty-eight such samples taken from the duckfoot treated area showed only 0.2 of an egg pod per square foot.

Subsurface tillage machine, made by attaching sweeps to two-row lister.



Subsurface tillage being accomplished with a three-sweep implement.

Below are five suggestions for meeting the grasshopper menace. If they are followed, reasonably effective control will result:

1. Plan in advance for control. Use tillage following harvest to create unfavorable egg-laying conditions in fields. Leave strips 15 to 20 feet wide, every 15 to 20 rods in the field to function as egg concentration areas. These should be tillage treated when grasshopper egg-laying has been completed, late in the fall.

2. Should it be necessary to use spring tillage, the tillage operation should be performed as early as possible with special attention being given to the outer edges of fields and to headlands.

3. Surface and subsurface cultivation methods are good in that they disturb the surface, egg-containing layer of soil. Deep plowing is also effective but cannot be recommended for areas where wind erosi[on] is prevalent.

4. In case of heavy egg infestation in alfalfa fiel[ds] use the spring-tooth harrow late in the fall or ear[ly] in spring to destroy egg pods.

5. Fields should be examined in the fall to dete[r]mine the amount of grasshopper egg deposition. I[n]expensive egg screens may be constructed from 1 by boards and ¼-inch mesh hardware cloth. S[oil] samples of approximately ½ square foot each and inches in depth should be taken at intervals over t[he] field and field margins. The screening of these i[n]dividual samples gives a good estimate of the seriou[s]ness of the infestation. Should the grasshopper eg[g] pod count run as high as one pod per square foot [at] the edge of the field, the infestation is sufficient[ly] heavy to warrant the use of tillage as a contr[ol] measure.

Using the one-way plow immediately after harvest to control weeds and conserve moisture. The surface mulch protect[s] the soil from wind erosion and affords unfavorable conditions for the deposition of grasshopper eggs.

WAR BOND NOTE

The Land Acquisition Division, Washington, continued to lead all other offices of the Soil Conservation Service during the month of June in percentage of total pay roll allotted for the purchase of War bonds. The Division has received personal commendation from the Chief.

Because Soil Conservation Service employees are so well acquainted with the benefits of conservation, it is not altogether surprising to find this Service close to the top of the list of bureaus and agencies of the Department of Agriculture in percentage of total pay roll allotted for investment in War bonds.

Conservation of everything we have, and living simply and sparingly so as to put every dollar possible in War bonds, will materially hasten the day of victory and a return to the peaceful way of living.

—John S. Fickling

PRACTICE PROGRAM SPEEDS PLANNIN[G]

The program for widespread application of sim[]ple conservation practices during the off-crop seaso[n] is showing definite returns in a speed-up in develop[]ment of farm plans in Georgia, State Conservationis[t] T. L. Asbury reports. During May, 718 complet[e] district plans were developed and 5 farmers not liv[]ing in districts cooperated in developing demonstra[]tion plans for their farms.

"In most cases," he adds, "these plans were mad[e] on farms where farmers had participated in the off[-]crop season work and, as a result, from 1 to 5 of th[e] practices called for in the plan had already bee[n] established."

Gwen

DAD PREACHES CONSERVATION

By GWEN HUNSAKER

Dad

"When it comes to dry-land farming on sloping and, a curved line is the shortest distance to victory."

THAT'S Dad doctrine and he's been preaching it, living it, and plowing it for 3 years now. On a census card or in the telephone directory, Dad's listed as Horace N. Hunsaker, Honeyville, Utah, but it's at our 300-acre dry farm in Whites Valley, 16 miles west of Tremonton, that he's been putting conservation farming to a test.

And, believe me, conservation practices have proved their value—and then some. Although Dad is thoroughly convinced of the soil benefits derived from conservation farming, he is also satisfied that this type of farming is essential in wartime because of its economy of labor and fuel.

EDITOR'S NOTE.—Miss Hunsaker is the daughter of a member of the board of supervisors, Northern Utah Soil Conservation District.

Facing a shortage of skilled farm labor, Dad was forced to find ways of doing the job in less time—and that's where contour farming comes in. By the old around-the-field method of plowing, he used to use a three-bottom moldboard plow, cutting a 3½-foot swath. Following the contour, the same tractor will pull an 8-foot wheatland plow at the same speed—a saving of over 56 percent in the time required to plow our farm.

And in these days of farm manpower shortages, gasoline rationing, and reduction in machinery manufacturing, it's a long step toward victory.

Not only does contour farming save labor, gasoline, and machinery, but we've learned on our farm that contour cultivation conserves moisture and precious fertile topsoil, both of paramount importance in producing high yields.

Contoured acres fight! On the Hunsaker property, strips of alfalfa, wheat, and summer fallow—all on contour—hold the soil, conserve the moisture, and boost the harvest. "Dad" Hunsaker and Melvin O. Hamilton, district conservationist at Tremonton, Utah, stand in the foreground.

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In 1939 and 1940, Dad plowed around the field and harrowed the ground. Both summers we had rains which caused quite severe run-off and washing of the topsoil. None of this run-off, however, came from the grassland above the field but started on the field itself. We lost a good deal of soil during those two summers. Little streams of water, starting on the upper part of our field, ran downhill and, in many places, took out soil as deep as a plow furrow and from a few inches to 4 or 5 feet in width.

In 1940, Dad signed an agreement with the Northern Utah Soil Conservation District to follow recommended conservation practices. He began by plowing on the contour that fall and finished the next spring with a wheatland plow and a modified moldboard. In the summer he abandoned the use of harrows and used only a rod weeder to destroy weeds.

During the summer of 1941, we had a very hard rain in June, bringing water even from the grassland above. Much to our surprise, however, the water was all absorbed in the contours and there was no washing at all. The rough stubble turned up by the wheatland and modified moldboard plows also helped to hold moisture and increased fertility by promoting faster decay of plant matter.

Another practice that Dad uses to prevent run-off is strip cropping. He's gradually working into a system of strip cropping, beginning at the top of the field with alternate strips of alfalfa, grain, and fallow. Over a long period of time, he expects to restore necessary nutrients to the soil with the alfalfa, but in the meantime he feels as if he's helping our Nation in a small way by producing feed for livestock.

Speaking of livestock reminds me of Dad's conservation practices on his three sections of range land. Now when somebody comes around who isn' quite convinced that range conservation really pays Dad gets a gleam in his eye and delivers a lectur that goes about like this:

"I'll tell you, man, my range took an awful beating for 20 years or more—no denying that. I use to think the way to get more money—and, for tha matter, the way to produce more—was to use a rang as hard as possible. Why, I thought it was ranl waste to let a few blades of grass go ungrazed.

"But I found out you can't keep grass fed off an expect it to keep coming back year after year. I you do, you throw nature out of balance. You'v got to have some plant residue returned to the soil.

"It took me a long time to learn that, and som people still haven't learned it. That's where th Soil Conservation Service helps out. For the last or 6 years I've been trying to build up my range First, I cut my herd to about 60 to 70 cattle instea of the 150 I used to run. Then I built a stock watering tank under the AAA program and got better distribution of salt.

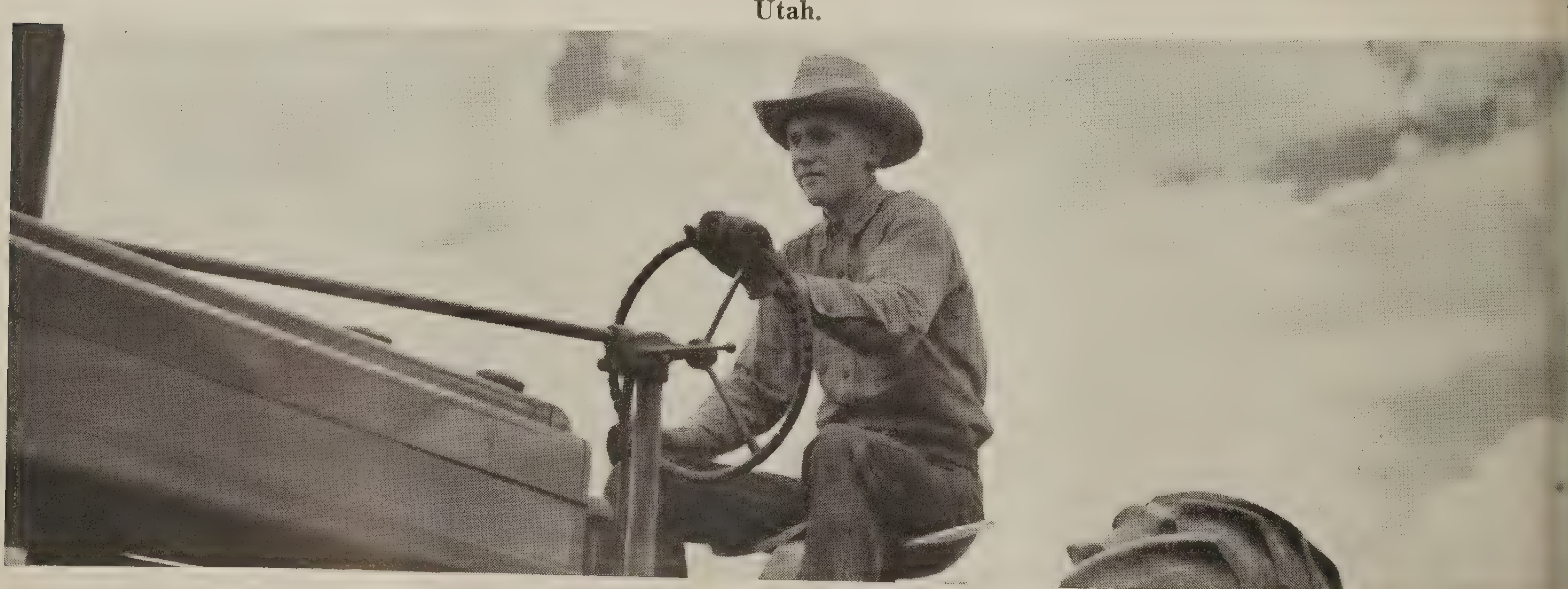
"You can see for yourself that the cattle are making better use of my range. And now, when w need more beef, I'm ready to produce it. This yea I've increased my cattle 35 percent over last year— and I'm doing it without hurting my range particle."

Usually, this convinces the doubting Thomases but, if it doesn't, Dad isn't discouraged, but just keeps on with his soil conservation gospel.

We also have turkeys on our farm. We like to classify them as a conservation measure, too. You see, the turkeys pick up feed left on the ground after the combine has threshed the grain. We raise all of the grains, as well as the green feed, needed in the turkeys' diet. Our turkeys are helping in the meat

(Continued on page 65)

You couldn't find a better hand anywhere than Byron Hunsaker, who is helping his father on the ranch near Tremonton, Utah.



RECOGNITION ACCORDED OKLAHOMA FARMERS

By LEON J. McDONALD

BECAUSE THEY HAVE done an outstanding job of establishing conservation practices upon their farms and increasing production of war crops, 701 Oklahoma farmers received certificates of award from the Oklahoma Bankers Association during the past year.

CERTIFICATES were given—and will continue to be given—to landowners and operators having cooperative agreements with soil conservation districts, who have been certified by boards of district supervisors as eligible for such recognition. The supervisors base their recommendations on records of performance compiled by Soil Conservation Service technicians.

The attractive certificates, framed for hanging, are provided by the association, the cost being borne by local banks. The banks also pay the expenses of meetings at which recognition is extended. Already there have been held 32 meetings, representing 17 soil conservation districts. More than 5,000 people have attended.

The local banker takes the lead in sponsoring each meeting, collaborates closely with district supervisors, and invokes the cooperation of public schools, civic clubs, chambers of commerce, theaters, town halls, community centers, and farm organizations. Recognition for good jobs of conservation farming has been accorded to white and Negro farmers alike, at meetings held in the communities of each.

The program is very similar to that of a school or college commencement. Winners come forward, receive their certificates, and are congratulated by the banker and by the chairman of the board of district supervisors.

Sometimes the recipients of awards are invited to tell of their experiences with soil conservation practices. Twenty-nine of the meetings have been addressed by the president or the secretary of the Oklahoma Bankers' Association.

Eugene P. Gum, State secretary of the association and editor of the Oklahoma Banker, has been very generous in devoting space to encourage soil conservation districts in their war production job. Following is but one of a number of similar editorials that have appeared in the Oklahoma Banker:

CONSERVATION FARMING IS A WAR WEAPON

A summary of information furnished us by farmers reveals that the establishment of conservation practices on their farms increased the value of the land 44 percent. The acre yield of corn was increased 37 percent, oats 27 percent, and cotton production showed an increase of 25 percent per acre.

Eroded, cultivated land planted to Bermuda grass showed an increased production of 64 percent and the use of conservation practices, such as mowing, controlled grazing, protecting from fire, and overseeding with clovers, increased the production of old pastures 80 percent.

This information indicates that the soil conservation district program is doing far more than conserving the soil. Such programs increase land values and are helping win the war through the application of conservation measures that increase production of needed war crops.

Gum gives much credit for the success of this project to a fellow banker, F. S. Hurd of Broken Arrow, Okla., who has been chairman of the agricultural committee 9 years. Hurd has been an advocate of soil conservation for many years and has served as chairman of the board of supervisors of the Arkansas-Verdigris Soil Conservation District since its organization in 1938. He has helped conduct seven meetings in the Arkansas-Verdigris Soil Conservation District to honor district cooperators who have done an outstanding job.

One of the best meetings was held in Tulsa, May 28, when more than 250 district supervisors, bankers, civic leaders, and farmers met in the Tulsa Chamber of Commerce banquet room. The meeting was jointly sponsored by the Tulsa Farm Club, the Tulsa bankers, and the supervisors of the Arkansas-Verdigris District. H. H. Bennett, Chief of the Soil Conservation Service, made the featured address.

The high point of the program was reached when Dr. Bennett himself was given a special certificate of award provided by the Oklahoma Bankers Association. The document bore the signature of Gov. Robert S. Kerr, of Oklahoma; Dr. Henry G. Bennett, president of Oklahoma A. & M. College and chairman of the State soil conservation committee; Nolan J. Fuqua, president of the State association of district supervisors; and L. C. Wright, president of the Oklahoma Bankers Association. In reality, it was a gift from all of Oklahoma—an expression of appreciation for able leadership of a tremendous undertaking. The presentation was made by Shawnee Brown, director of the Extension Service and vice chairman of the State soil conservation committee.

EDITOR'S NOTE.—The author is Acting Chief, Regional Information Division, Soil Conservation Service, Fort Worth, Tex.

Governor Kerr expected to attend, of course, but an emergency called him to the National Capital. His telegram was read—

Business for the State brings me to Washington today and am sorry that I cannot accept your invitation to address the group of distinguished men assembled in Tulsa today, as you requested me to do.

I would like to personally do honor to the progressive farmers of eastern Oklahoma who will receive certificates of award from the Oklahoma Bankers Association for having met the requirements of the soil-conservation districts. By establishing the necessary practices they have proved themselves worthy of this recognition. They have not only conserved the moisture and increased the fertility but have saved this priceless topsoil for future generations. The encouragement Oklahoma bankers are lending to such a worthy cause cannot be commended too highly.

To H. H. Bennett, Chief of the Nation's Soil Conservation Service; to Louis P. Merrill, regional conservator, S. C. S.; to Henry G. Bennett, chairman, State soil-conservation committee; to Nolan Fuqua, president, Oklahoma Soil Conservation District Supervisors Association; to L. C. Wright, president, Oklahoma Bankers Association; and to all who are interested in saving the soil, I send my heartfelt congratulations, and do hope that thousands of Oklahoma farmers will take advantage of your leadership to increase our food-for-freedom and preserve this priceless legacy.

The accomplishment of Mrs. Ethel E. Falconer and her two sons, one of whom is now in the Army, is an excellent example of the kind of work being recognized by the Oklahoma bankers and shows how the district program of treating the land according to its needs and adaptabilities is helping to win the war by increasing production. This family in 1937 suddenly inherited the sole responsibility of managing a hitherto unprofitable 240-acre farm. A cooperative agreement was signed with the supervisors of the east central Oklahoma soil-conservation district in June 1938.

The "before agreement" figures show 150 acres were being cropped: 47 acres of corn, 72 acres of oats, and 31 acres of cotton. Acre yields were low, cash receipts were small, and very little progress was being made in lifting the mortgage on the farm. Most of the ready cash was received from 5 dairy cows, 4 calves, 10 sheep, 4 sows, 29 pigs, and a small flock of poultry. Pastures were overgrazed and undeveloped. Stock water was inadequate. Very little protein forage or hay was being grown.

The "after agreement" figures revealed by a recent inventory show 80 acres of cultivated land protected by terraces, farmed on the contour, and improved through the use of a good crop rotation. A 30-acre meadow of sericea lespedeza provides an adequate supply of protein hay for the 60 head of Angus cattle accumulated during the past 5 years. One hundred and twenty acres of excellent Bermuda grass pasture have been established. Most of this Bermuda acreage was formerly cultivated land and produced low yields of cotton and corn. The pastures have been overseeded with Korean lespedeza, yellow hop, and white Dutch clovers to provide grazing 10 months of the year. Pasture management includes weed control, protection from burning, and controlled grazing.

Farm ponds have been constructed to provide an adequate supply of water for livestock. Each pond is fenced and water is piped to a trough located below the dam. Three trench silos have been built and a minimum of 1 year's feed supply is maintained at all times. Six brood sows and a large flock of poultry constitute an important part of this food-production factory. The Falconers are out of debt.

Hurd reports that the program of presenting certificates of award to deserving farmers has done more to inform bankers about the soil conservation district program than anything else. Work unit leaders say that farmers have been encouraged by this recognition. Those receiving the award feel a keen responsibility to make a good program better and other district cooperators have been stimulated to complete the program on their farms. The meetings and attendant publicity have been instrumental in leading the public to appreciate the importance and value of a complete, coordinated program of proper land use.

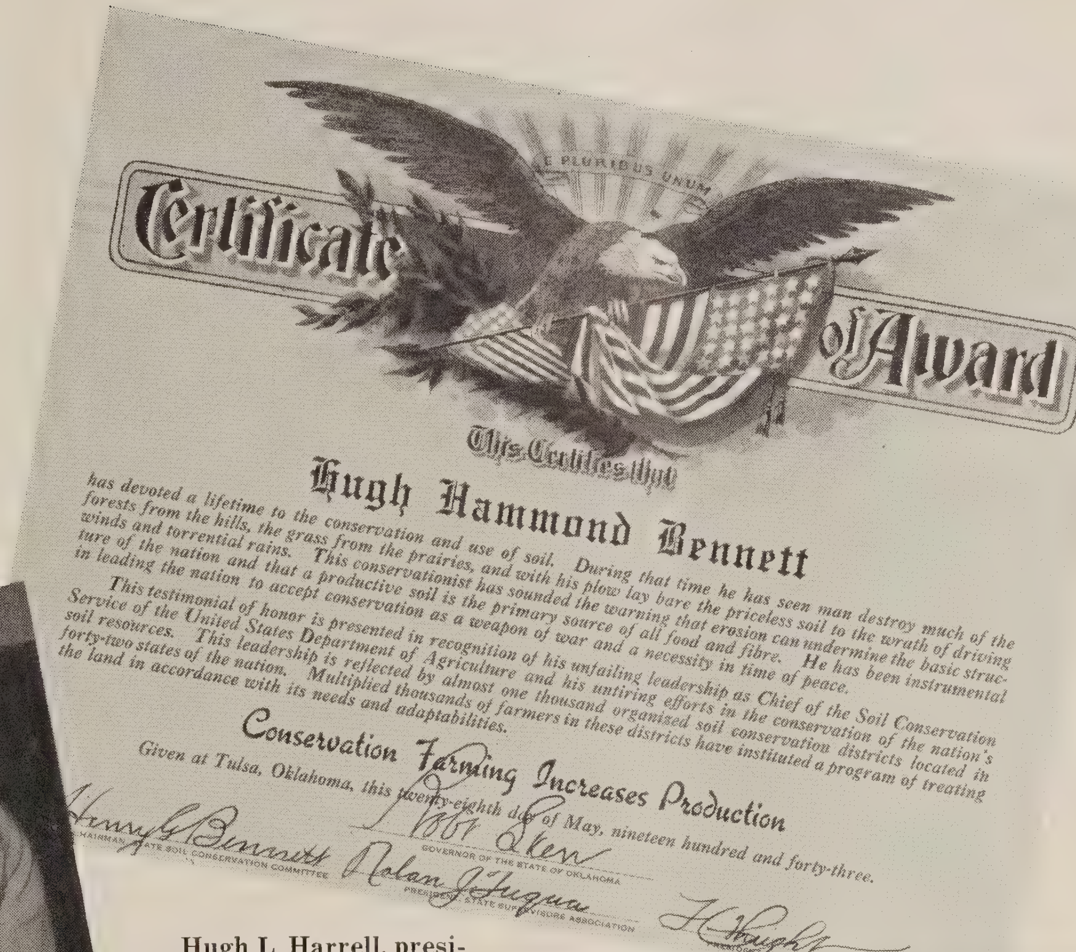
Bankers and district supervisors have been pleased with the results obtained this year, and plans for the future include holding meetings in each district at least once a year to honor other district farmers who qualify. Follow-up meetings of groups previously honored have been held on the farm of one of the farmers who received a certificate. Whole families were included, well-filled lunch baskets were brought, and the event combined business with pleasure. They were conservation picnics. The host accompanied the men and boys on a tour of the farm to observe results of the practices established. Opportunity was given for discussion and swapping of experiences. Local banker, district supervisors, group leader, county agent, vocational teacher, and work unit leader were presented. The district supervisors believe this is a good way to increase the interest of all members of the family in the conservation program and to encourage farmers to do a better job of maintenance and soil improvement.

What do farmers think of these certificates of award?

A. H. McGrew, Broken Arrow, says, "My family and I are proud of the award. They put my photo in it and hung it in the front room for all to see. I'm behind the soil conservation district program 100 percent."

C. W. Wolcott, Coweta, sums it up this way, "It really makes farmers feel that their work is appreciated by others, who notice the improvement in their work and in the appearance of their homes."

)octor Bennett receives a special ertificate of award from Shawnee 3rown, director of the Extension ervice and vice chairman of the)klahoma State Soil Conservation Committee. The certificate, reproduced at right, is of same general orm but of different wording from hat awarded outstanding farmers of the districts.



Certificate of Award

E PLURIBUS UNUM

This Certifies that

Hugh Hammond Bennett

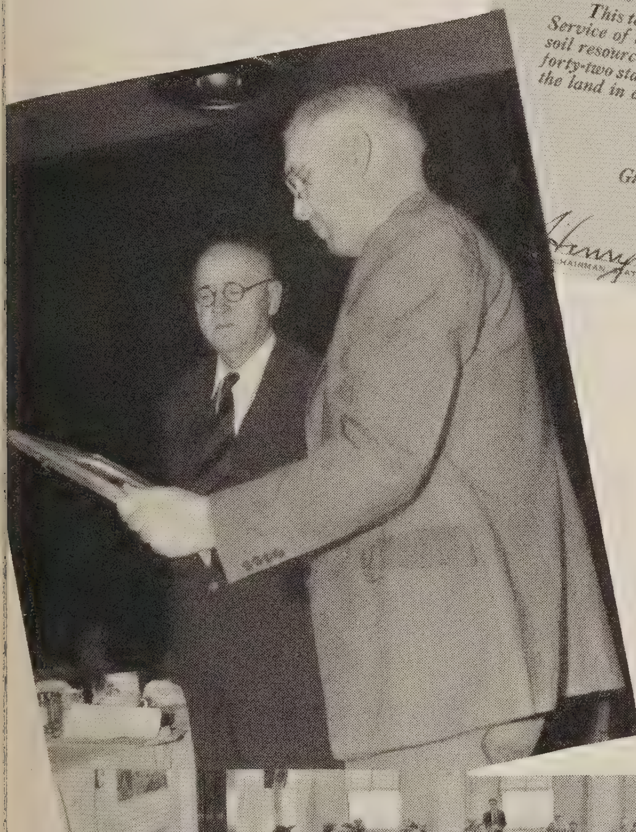
has devoted a lifetime to the conservation and use of soil. During that time he has seen man destroy much of the forests from the hills, the grass from the prairies, and with his plow lay bare the priceless soil to the wrath of driving winds and torrential rains. This conservationist has sounded the warning that erosion can undermine the basic structure of the nation and that a productive soil is the primary source of all food and fibre. He has been instrumental in leading the nation to accept conservation as a weapon of war and a necessity in time of peace.

This testimonial of honor is presented in recognition of his unfailing leadership as Chief of the Soil Conservation Service of the United States Department of Agriculture and his untiring efforts in the conservation of the nation's soil resources. This leadership is reflected by almost one thousand organized soil conservation districts located in forty-two states of the nation. Multiplied thousands of farmers in these districts have instituted a program of treating the land in accordance with its needs and adaptabilities.

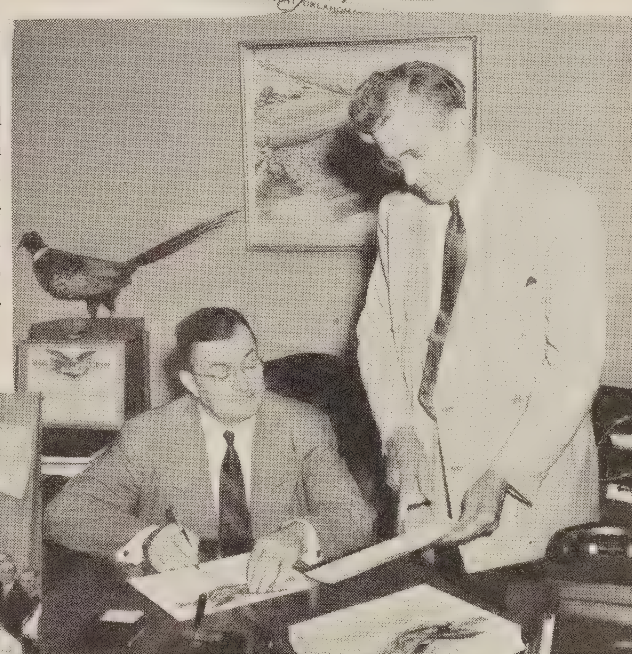
Conservation Farming Increases Production

Given at Tulsa, Oklahoma, this twenty-eighth day of May, nineteen hundred and forty-three.

Chairman State Soil Conservation Committee — Governor of the State of Oklahoma — President State Supervisors Association — President Oklahoma



Hugh L. Harrell, president of the Oklahoma Bankers Association, signs some of the 701 certificates of award that have already been presented to conservation farmers of the State. Eugene P. Gum (standing) is in his twenty-seventh year as secretary of the Association.



"Graduates" were guests of the Tulsa Farm Club and the Oklahoma Bankers Association at a banquet in the dining room of the Tulsa Chamber of Commerce. The Chief of the Soil Conservation Service, at the extreme right, made the principal address.

BUILD SOIL

(*From the Preface of a Forthcoming Book, "Soil and Health," by O. E. Fink and Russell Lord*)

Soil is the eternal treasury of mankind. It is the most familiar and yet the most mysterious stuff on earth. If we as a people were as interested in soil as we are in motor dynamics, much less of our country would be surfaced with soil run-down or abandoned.

Erosion is the most damaging form of soil depletion. But plants, working quietly, also take life out of the soil. And if those plants are shipped away, or walked, or trucked away in the form of livestock or troops, then that much life is taken from a given place on earth, removed elsewhere; and to that extent the soil and the life it supports are weakened.

It is a grim fact, but "cannon and plants eat the same fodder," as the War Industries Board announced to American farmers seeking larger allocations of fertilizer during the First World War. In many ways, war hastens soil depletion and heightens the difficulties of soil replenishment. Ground-line post-war problems, this time, are going to be terrific. And yet, in the light of new techniques and developing knowledge, these problems do not seem to lie beyond hope of solution. The approach, it would seem, requires a closer knowledge of real values, and a new kind of national bookkeeping, which may lead us to a new kind of international trade.

Here in the United States we seem at last to have come to a time of maturity in our national life when instead of holding soil "dirt cheap" we are learning to think about it with anxiety, with respect, and even with the reverence that men accord, in patriotic song and utterance, their native land. The contemptuous indifference with which, in our national childhood, we manhandled our great gift of soil is passing. But we still have a great deal to learn.

Take a clean apple from the tree, wipe it, and stand it in the sun. Immediately that apple begins to die and yet, in a way mysterious beyond expression, to prepare in multitudinous forms to come to life again. You place it in the sunshine and before you can move your hand away the change has started. At least two things have started that give some idea of what soil is. First, on the invisible film of hygroscopic moisture which envelopes the skin of the apple an invisible layer of dust gathers, a layer of dust infinitely thin—"dirt," we call it profanely, but with minerals and bacteria in it, the very stuff of life. And at the same time, imperceptibly but surely, the organic matters in that apple will have started to rot. Whether you eat that apple or not, it is going the way of all flesh, back to the earth again; and once in the earth it will play a part in bringing forth new life.

And so, in a large way, it is with this much greater globe than an apple, with our earth and the changing face of earth as a whole; of our earth, with its exceedingly thin film of rotting rock and water and air and micro-organisms and major organisms, notably man. Soil offers man and his evolving races and civilizations a thin and shifting habitation at best. We must come to terms of careful culture—or agriculture—if we are to remain a perpetuating people, well-provisioned and strong.

A permanent agriculture pays back to the soil, on the spot, as much fertility as is drawn from the soil, or more. Few farmers have been doing that on American soil; and it is harder to do so now, with a global war blazing at our resources, than it has ever been before.

Even so, our chances of coming through this war and the postwar reconstruction are brighter at this time than they were in World War I. We know more about soils than we did then and, even more important, we care more. By better farming practices widely spread through such agencies as the Soil Conservation Service and the State extension services, we may vastly reduce the waste of soil and minerals by erosion. That, in a considerable measure, is being done. But it would be a sanguine guess to say that the pressure of sustained prices and greatly increased production quotas will be offset by these improved practices, or that our erosional losses will diminish even as our farm yield increases.

The new practices have spread very widely, however, in the past 10 years or so; and this may happen. In any event, we know that the shameful bleeding and blasting of soil that marked our part in provisioning World War I will not be repeated heedlessly and in toto. The essential thing, this time, is that we know what we are doing, and do it as intelligently and as carefully as we can.

Now and in the years to come we shall need to practice a new kind of accounting in dealing with the earth. We are learning. Remarkably little disturbance arose in either governmental or financial circles when news of the sinking of a shipload of gold, outward bound, was recently made public. If shipments of the high-analysis phosphates we are sending in quantity from our TVA area to revive the besieged and overdriven soil of England were to be sunk, such loss, in the light of current needs and values, would be far more serious. Gold in the utilitarian sense, might have filled some teeth that needed filling. But these phosphates, grown into crops, will help fill stomachs. They will help build sounder teeth, better bones, stronger muscles, stouter hearts, and increasing strength of mind and purpose among all who eat of the crops of England. This, at present, includes quite a few Americans. Viewed thus, our lend-lease transactions in high-powered nutrients with England and others of our allies becomes a vital form of international exchange.

HUSBANDING FEED RESOURCES VITAL TO WAR PRODUCTION

By WALDO R. FRANDSEN

PART OF THE SOLUTION of the conservation and livestock production problems in southern Idaho appears to be found in better feeding practices in the winter feed lots and on the ranches.

A ranch planning analysis of the Thomson Brothers sheep ranch in the Mayfield Soil Conservation District recently revealed some interesting information regarding the actual amount of hay that might be saved by avoiding the wasteful local practice of scattering it around in feedlots.

Tables prepared in cooperation with the University of Idaho were used to determine the feed requirements for the sheep. After making necessary allowances for 150-pound crossbred ewes rather than the 120-pound ewes on which the data were based, and for second grade hay instead of first grade hay, the recommended daily hay allowance was computed to be about 6 pounds per head. At this rate of feeding, the 4,100 ewes carried on this ranch would require approximately 1,435 tons of alfalfa hay for the winter feeding period. The cooperator actually purchased and fed some 1,600 tons of alfalfa hay during the previous winter. An inspection of the feedlots led to the conclusion that at least 165 tons of hay had been trampled into the manure and wasted. The difference of 165 tons of hay at last year's price of $15 per ton represents an additional and unnecessary outlay of $2,475.

Aside from this substantial monetary loss, the poor feeding practices were also responsible for destructive grazing on surrounding range. A year ago because of the long, severe winter and the high prices of feed, ranchers in this locality requested the Grazing Service to open the grazing season on March 15—much earlier than usual. Cheat and Sandberg bluegrass, the grasses which furnish the bulk of the spring forage on these sheep ranges, were abnormally late in developing and were showing very little spring growth on that date. Ewes on this forage could not keep up milk production and lambs could not make optimum growth.

EDITOR'S NOTE.—The author is zone technician, Pacific Region, Soil Conservation Service, Portland, Oreg.

The 165 tons of wasted hay, if properly fed would have provided feed for the 4,100 ewes for 2 additional weeks. Ordinarily, these 2 weeks would mean the difference between turning the livestock out to graze too early or waiting until the range is ready to be grazed.

In going over these points with the rancher, a number of other management factors and ranch problems came into consideration. Sheepmen in the Mayfield section do not produce the hay needed for winter feed, but purchase it instead from farmers along the Snake River. Hay is sold by measurement in the stack. Since overmature hay usually means greater bulk and results in greater tonnage measurement, the farmers raising the hay pay more attention to quantity than to quality. In many instances the large amount of ripe seed of cheat found in this overmature hay has caused blindness to sheep; this is because the animals, forced to eat from feed racks, catch the seed falling from the disturbed hay in the wool around their eyes. There is, therefore, considerable opposition to feeding sheep from feed racks, ranchers preferring to waste the hay by open feeding on the ground.

Chopping the hay would eliminate wastage of feed and reduce the hazard of injury. Although a few ranchers along the Snake River are reported to be successfully feeding chopped hay, thus saving as high as 35 percent in amount of feed used, the practice is not general.

An acute phosphorus deficiency has also been found in this locality. This may be due, in part, to wastage of fertilizer. In at least one instance sheep manure has been pushed from the feed lots into the Snake River rather than spread on the hay lands. Proper spreading of sheep manure, together with annual applications of superphosphate or treble superphosphate, has been recommended to increase the yield of alfalfa hay and improve its quality.

The practices described here are significant because they suggest means by which conservation

The productivity of such pastures as that shown in the foreground can be increased materially by better grass mixtures, mowing of weeds, and improved irrigation. Such practices will produce more feed over a longer period and thus relieve the surrounding range, which is frequently overgrazed.

of forage resources will increase the production of livestock on privately and federally owned ranges in the Mayfield district. It might be concluded that proper fertilization and shorter rotations of alfalfa lands with suitable grasses seeded with the alfalfa, would also help to solve many of the conservation and land use problems. Perennial grasses seeded with the alfalfa, together with shorter rotations, would largely eliminate the hazard of injury from cheat and remove the objection to feeding it in feed racks. Feeding good quality hay in feed racks would permit an appreciable saving in hay itself. Eliminating the wastage of hay would result in ample feed until the range is ready to be grazed in the spring. Shortening the spring grazing period through longer feeding would considerably decrease the pressure on the range forage, and permit adoption of management practices that would facilitate a maximum rate of range recovery. A higher percentage lamb crop and increased weight of lambs at marketing time could be expected.

The solutions suggested do not involve an increase in hay acreage, but rather the elimination of wasteful production and feeding practices.

Planning technicians of the Soil Conservation Service can go far in assisting both farmers and sheepmen with problems of this kind, and thus not only help to conserve the forage resources but increase the production of livestock vitally needed for war.

(Continued from page 58)

shortage, and they're also increasing the fertility of our land, since we use the wheat stubble as a poultry range for several months of the year.

All of this—conservation of soil, water, labor, and fuel through contour farming, increased beef production through better range practices, growing turkeys to make the best use of available feed—add up to Dad's definition of conservation farming.

AB HAS THE RIGHT IDEA

By KENNETH E. BRADSHAW

Ab Gubler inspects a stalk of orchard grass, one of the best species for hay and pasture in the White Pine Soil Conservation District.

AB GUBLER stretched face downward on the edge of the irrigation ditch, took a big drink of water and came up panting.

"Water's so scarce here I hate to drink out of my own ditch," he grinned, "but I'm sure thirsty."

We jumped the ditch and started across his planted hay meadow. The field had been sown to grasses and clovers in July 1941, and now was producing hay and pasture where alfalfa could not grow. Here was a vivid example of increased production—the kind we now need so badly to help feed and clothe our fighting men and their comrades under other flags.

"I wish you could have seen these 5 acres last year just before we cut them," he said. "Reed canary grass and timothy stood higher than my head—they were up between 5 and 6 feet. Meadow fescue and orchard grass were about 5 feet high, and the redtop was up about 2½ feet. There was a good growth of mammoth red and alsike clovers, besides."

Considering the fact that Mr. Gubler's ranch is situated in the White Pine Soil Conservation District in eastern Nevada, where growing conditions are hardly ideal, the figures on the growth of his seeded pasture plants were quite surprising.

I could see that the seeded species had not yet made a heavy sod, so I asked him about the yield.

"Never figured it out exactly," he replied. "But I do know that it was so thick I could hardly run the rake through it. Let's see—I got some 360 bales, and they'd go between 80 and 90 pounds each. I think an 85-pound average would hit it pretty close. That was on 5 acres, less a piece for the lane . . ."

We did some quick calculating.

"Over 3 tons to the acre," he concluded. "That's about what I thought it would run."

Three tons to the acre is good for the White River Valley. Short growing seasons, inadequate water, alkali, and other factors normally keep yields down. The many limitations preventing maximum crop production provide the basis for a broad program being carried out by the Soil Conservation Service in cooperation with farmers and ranchers.

To gain the complete picture of production, grazing of aftermath also must be considered. During the first year the field was grazed a bit, but the stock were herded away to the adjacent alfalfa aftermath

EDITOR'S NOTE.—The author is district range conservationist, White Pine Soil Conservation District, Ely, Nev.

whenever they drifted to the new seeding. An electric fence to protect it could not be provided until the next year.

"I held them off," he explained, "because the ground there is pretty wet. Their feet would have cut right through and tramped out the tender seedlings. Those little plants need protection."

Last year, after cutting the big hay crop, Ab let the aftermath grow up to about 18 inches and then started pasturing it. He had 10 head of milk cows on it for a month straight, which makes the neat figure of better than two animal-unit-months an acre. Alfalfa aftermath in this country, unless quite heavy (or overused), yields only about one animal-unit-month to the acre.

Ab certainly has the right idea when it comes to increasing production, now so vitally important because of war demands for farm products, by seeding grasses and legumes which are best suited to the class of land that is to be cropped. His meadow is on a piece of poorly drained, alkaline bottom land. He tried planting alfalfa on it first, but the site was too wet. It came up nicely, but was completely killed out the following spring. It was then that

Ab Gubler surveys his 2-year-old meadow of orchard grass, meadow fescue, smooth brome, timothy, Reed canary grass, red clover, and alsike clover. Yield last year was 3 tons of hay and 2 animal-unit months of pasturage from each 5 acres in the field.

he decided to try out the grass-clover combination. He put the seed on "plenty thick"—about 25 pounds to the acre—and came through with a stand that was admired by everyone who saw it.

This spring (1943), growing conditions were far less favorable than they were last year. As a result, his grasses were checked and headed out prematurely. The clovers did not withstand the cold of last winter very well, and it probably will be desirable to reseed some more alsike. On the other hand, alfalfa stands were frozen badly by late frosts, so the grass hay still is expected to exceed the average alfalfa yields.

Ab's grass plantings have not been restricted to the one described. Last fall, he put orchard grass, smooth brome, redtop, timothy, and red clover on an adjacent field. It came up well, but likewise suffered from the poor growing weather this spring. But he is not discouraged, and has high hopes for the seeding.

"Grass is funny stuff," he said. "You don't think you have anything the first year, but it will come through."

His 4-acre piece of smooth brome, put in on a plot of higher ground in June 1942, is another successful seeding—one from which he planned to harvest seed this year. It was this seeding which taught him the hazard of using too heavy a nurse crop. The brome made a good crop, but this was his opinion:

"I used 100 pounds per acre of barley, but I won't ever do that again. I'll use 50 pounds—cut it in half. A full crop takes the moisture away and shades the grass too much. And cutting the barley, hauling a combine over the field, is a detriment to the grass when it is so young."

Ab has some ideas on the advantages of grass hay as a feed also. He maintains that calving heifers often will produce too large calves when fed straight alfalfa hay, and he has lost many calves, and some heifers, too, on straight alfalfa. Feeding grass hay will eliminate that trouble, resulting in the saving of many dollars for the farmer and increasing the milk and meat output for the national war effort.

The existing alfalfa fields on Ab Gubler's ranch are going to be replanted to hay after they are broken up in the crop rotation, and the hay will include grasses as well as alfalfa.

"I've tried alfalfa on all this," he explained, taking in the subirrigated croplands with a broad sweep of his arm, "but I'm going to put it into grasses. That higher land up there I'll put into grass and alfalfa. The alfalfa may go out, but once you've got grass, you've got it permanently. It makes better pasture, too, with grasses mixed in. A cow likes a mixture of feed just like a man."

Ab is one farmer who has seen the advantages of grass seedings, and feels confident that he can fit them into his land and livestock pattern to more nearly attain maximum production. He, however, is just one of many who have been experimenting with grasses and clovers in this part of the country. Such experiments have been followed too often by discouragement, because results did not meet expectations.

There is noticeable now a change in results and a change in attitude. With the gradual gathering of

information by the hard way of trial and error, an accumulation of facts and figures is pointing out the species that may be used on different sites, the proper rates of seeding, the time and method of seeding, and how to manage the pastures and hayfields for maximum prolonged production.

The White Pine Soil Conservation District is swinging into step beside the farmers. It is helping them with their seeding problems, checking site conditions, introducing new species, and recommending the best methods of seeding. The Soil Conservation Service is furnishing technical assistance in this work. For established pastures there are approved practices to be encouraged, and special problems in management to be studied and solved. The job ahead will be big, but it will likewise be important. Good pastures and hayfields will supplement alfalfa and replace inferior or worthless brush and native pastures. Increased feed will mean increased production of milk and meat and other products for the war period and later, as well as more income for the farmers.

PASTURING FALL PLANTED GRAINS

(Continued from page 52)

real effort. It is perhaps not generally realized that sufficient return can be obtained from grazing fall grains to pay for the seeding and also obtain a nice profit even though the crops are not to be harvested for grain. In such cases grazing can be carried on right up to the time the land is to be prepared for seeding spring or summer crops.

In recent years, disease-resistant strains of winter grains have been developed by the Bureau of Plant Industry and State experiment stations, and are quite widely distributed. All possible effort should be made to encourage more extensive use of these improved varieties because undoubtedly more grazing can be obtained from them. Information concerning them can be obtained from the several State experiment stations or the Bureau of Plant Industry.

The Soil Conservation Service has a common objective with other Federal and State agencies in pushing the program for seeding more fall grains for grazing. A great deal of emphasis should be placed on this program because it will lighten the load on concentrate feeds. Most of you are aware of the shortage that existed this past winter in cottonseed meal, soybean meal, and other concentrates, and there is no reason to expect that the situation will be improved this coming winter. The needed protein for livestock can be obtained to a large extent from the winter pasture. There is perhaps no one thing that we can do that will have as great and immediate effect on the production program as will a campaign of seeding fall grain.

Winter wheat following corn in Hunterdon (township), N. J.—a common practice in many localities in the Northeastern States. Such a seeding will furnish excellent fall and winter grazing.

ON THEIR WAY

The "fourth dimension" in farm planning is discussed by Harry H. Gardner in an article to be published soon in this periodical. In the meanwhile, make a guess as to what this "fourth dimension" is.

Important doings at this year's soil-nutrition-human health session at Tar Hollow will be reported by word and picture in next month's issue of Soil Conservation. Men and women distinguished in varied scientific fields came from near and far to exchange their views. Tar Hollow is growing in fame.

Irrigation is on tap for further consideration. An article now in the mill tells of important accomplishments in New Mexico.

HE GROWS PEACHES IN THE TROPICS

BY G. L. CRAWFORD

OFTEN IT PAYS to do the unusual thing in an unusual way. This is what Declasse Moise thought after he went broke raising sugarcane in Haiti in 1935. He migrated from the low level sugar lands of Haiti to 4 acres on a rocky knoll 4,500 feet above sea level near Kenskoff, a mountain summer home area about 12 miles from Port-au-Prince. He contracted to pay $65 an acre or a total of $260 for his farm and, to show his faith, he made a down payment at the outset of $12, all of the money he possessed.

Moise terraced his land, raked the rocks to the outer edge of the terrace, dug and blasted out holes in the rocks, carried in rich soil by hand, and planted peaches, plums, figs, cauliflowers, and artichokes. He planted leguminous crops to supply as much nitrogen as possible.

Peach trees are the chief source of revenue. Moise obtained the stock from Florida. A pound of his peaches brings 20 cents and consists of from two to four of the fruits. He does not have frost at the 4,500-foot elevation, but he does have a cold period which causes the deciduous trees to go through a dormant period. His crops thrive in that climate and altitude. In fact, he has a reputation in Port-au-Prince and among tourists as being a producer of fine-quality vegetables as well as fruits not commonly grown in the Tropics. He sells all that he can grow. In 1941 he felt the need of additional land and rented 1½ acres on which to grow onions for the local market.

This enterprising farmer sold $4,000 worth of produce in 1940. All of his work was done by hired labor and with hand tools. His expenses for that year were approximately $1,500.

Declasse Moise and his home, paid for by growing peaches in the mountains near Kenskoff, Haiti.

In 1941 he probably increased his income by some $1,000 from the production of onions on the additional land.

In learning how to grow rare products for the tropics, Moise is not neglecting one of the main opportunities on the farm—that is, living in comfort and taking advantage of local material to contribute toward that end. His beautiful home is built from local stone and is nicely equipped with furniture made from local hardwood. He is a sound businessman, has his office in his home, keeps careful records. The agricultural officials of the Haitian Government say that Moise often consults them on problems arising in connection with his farm.

The lesson we can learn from this farmer in the mountains of Haiti is to look around us as he did and develop the unusual things where there is a demand for them and to do it in a systematic and intelligent way. Many of us cannot only increase our net earnings but at the same time serve our community and country, as well.

HOME ORCHARDS THAT NEVER FAIL

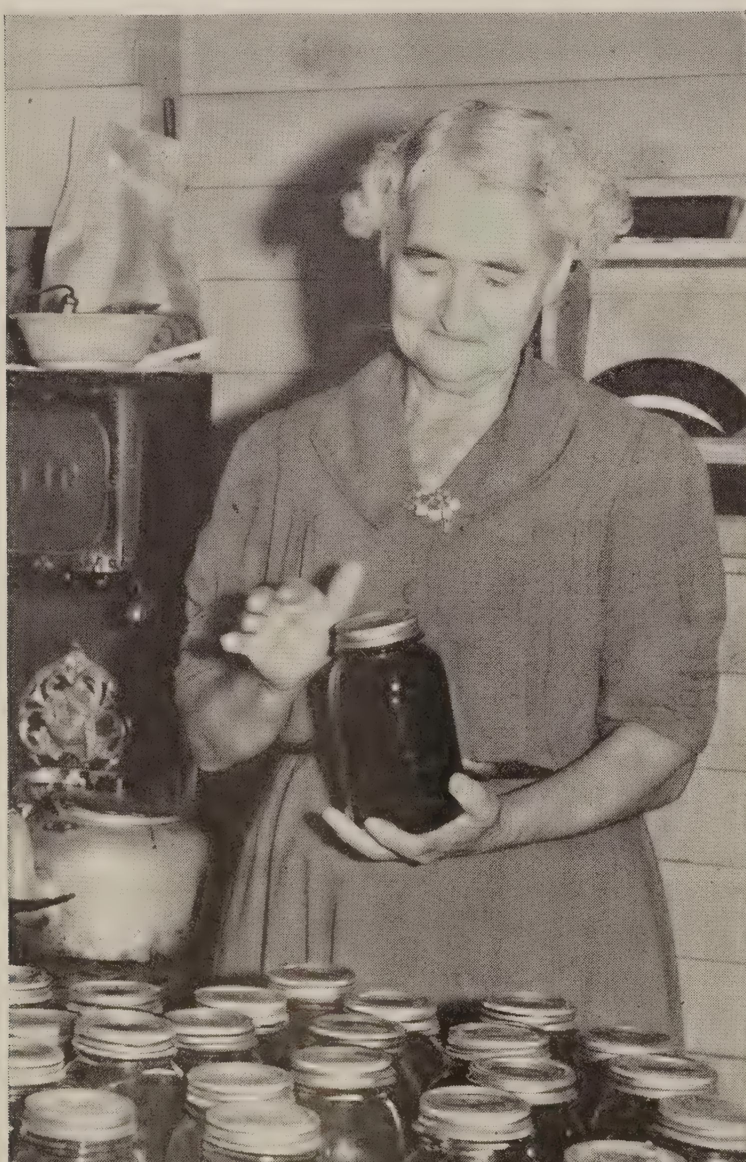
By HOMER G. TOWNS

THE NATIVE PLUM thicket and wild blackberry patch happen more by accident than by deliberation. If they are permitted to grow unmolested, they seldom fail to produce food. Most of these "native orchards" started voluntarily in an isolated corner of a cultivated field, in a stony outcrop in the middle of a pasture, along the bank of a stream that runs through a farm, or along the border between a woodlot and a cultivated field.

For many years such "odd" pieces of farm land have been called waste areas. In too many instances they have been wasted indeed, because a desirable type of vegetation has not been permitted to become established on them.

Today when more food means the difference between life and death for millions of people and when food actually means so much in the battle for freedom, there should be no such thing as idle land on farms and ranches. Every plot should be producing maximum yields of needed and adaptable crops.

EDITOR'S NOTE.—The author is regional biologist, Soil Conservation Service, Fort Worth, Tex.



Mrs. Scott smilingly appraises some of the 47 quarts of wild blackberries she canned this year.

Stream banks, field borders, small isolated areas, marshes, and rough, rocky, or badly eroded areas total approximately 33,000,000 acres on the farms and ranches of this country. As long as such lands are regarded as waste patches, they probably will remain essentially that. Instead of receiving management that would offer some possibility of an income, waste lands are usually abused to such an extent that they continue to deteriorate.

Native wild fruits and berries are well adapted to many so-called waste lands. Where such sites are properly protected from fire, farmers have been able to harvest a profitable crop of fruit every year for many years.

Mrs. R. S. Eason, Smith County, Tex., said recently, "We have canned at least 150 quarts of berries every year for 30 years from blackberries growing along the branch that goes through our pasture. And we have never failed to get enough wild grapes right here on the place to make all the jelly we need."

Ruth Causey, home demonstration agent, Rusk County, Tex., said, "Nearly all the families that I work with in this county can a lot of the wild fruits and berries every year. At least one-half of the fruit used by these families is supplied this way. Uncontrolled fires seem to be the only thing sometimes preventing the blackberries from making a crop."

P. R. Johnson, director of the experiment station at Tyler, Tex., pointed out that blackberries, dewberries, huckleberries, and some species of wild grapes seem to make a crop every year. Wild plums will make a crop at least 3 or 4 years out of 5.

A few simple management measures—protection from fire and from too much trampling by livestock, and the removal of tree species about once every 5 years—would convert hundreds of acres unsuited to cultivated crops, pasture, or woodlands into "home orchards" that would seldom, if ever, fail to produce

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For REFERENCE

Compiled by ETTA G. ROGERS, Publications Unit

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SOIL CONSERVATION SERVICE

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HOME ORCHARDS THAT NEVER FAIL

(*Continued from page 70*)

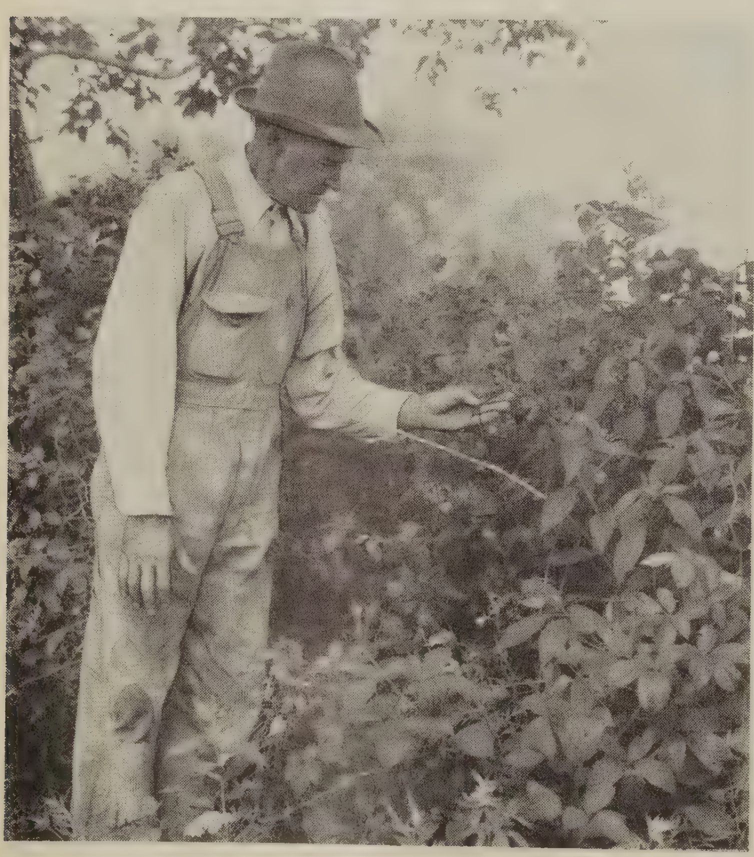
enough fruit to supply most of the home needs for a lot of farm families.

Simple management practices applied to "berry patches" and "plum thickets" that are already present on farms and ranches throughout the country undoubtedly would result in a material increase in essential food.

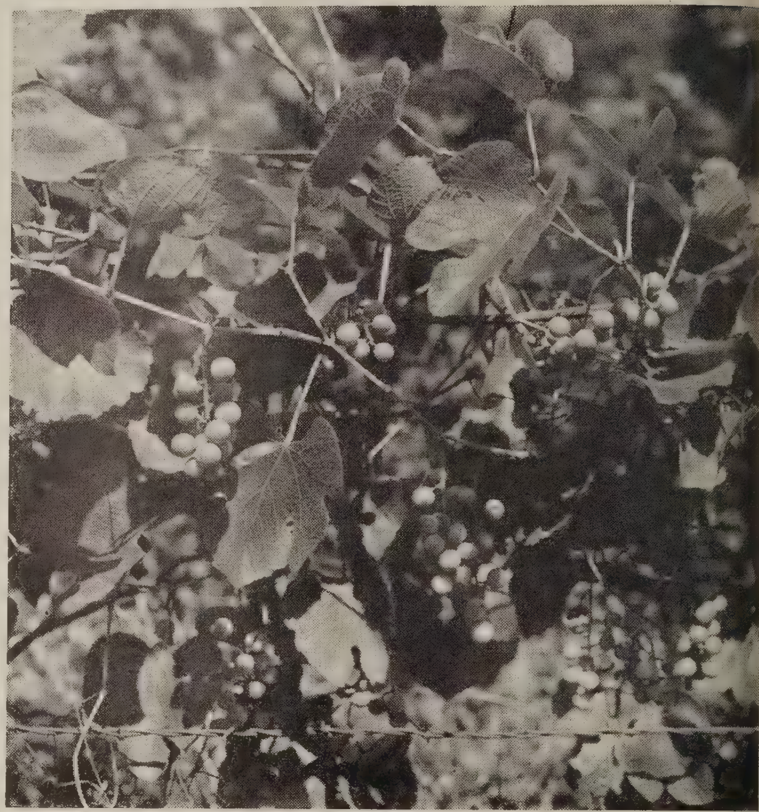
Present acreages of "home orchards" could be increased severalfold if farmers would establish "plum thickets" and "berry patches" and other fruit-producing plants wherever they can be made to thrive on land not otherwise in the revenue-producing class. Many sites which could be converted into "home orchards" are now utterly void of vegetation or are supporting a type of growth that fails to protect the land adequately from erosion. In many instances, erosion and run-off from these areas are damaging adjacent cultivated land by contributing to floods and otherwise reducing the value of good bottomlands.

Irrespective of the harvest value of "home orchards," they admittedly offer a type of vegetation which on many critical sites are often the best means of controlling erosion. Used properly, the "orchards" also will afford the most desirable kind of wildlife habitats.

Before we can achieve a program of complete land use, the term "waste land" must be made obsolete.



A. P. Scott takes a look at the ripening berries on his place.



Why not grow a valuable fruit instead of obnoxious weeds along some of the fences?

REVIEWS

FISH FOR FOOD FROM FARM PONDS. By Verne E. Davison and J. A. Johnson, United States Department of Agriculture Farmers' Bulletin No. 1938, 22 pp. illus. May, 1943.

A 1-acre farm pond can yield 350 to 400 pounds of palatable pan-sized fish each year, we learn from this new bulletin by two Soil Conservation Service biologists. Practical instructions for stocking, fertilizing, and harvesting pond fish are simply stated in the publication and directions for building a small pond are also outlined. There is a brief discussion of how to protect the pond from sedimentation through the establishment of erosion-control practices on the pond watershed. The management principles discussed, although based upon experience in the Southern States, are, with local adaptations, applicable in many other parts of the country. Neatly illustrated, the bulletin represents the Department's first contribution to this method of supplementing the farm diet by a home-produced source of vitamin-rich food at a very reasonable cost.

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October 1943

SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

Contents

Front Cover
Scene: Harvesting potatoes grown on contour, Limestone, Maine.
Photographer: George C. Lowary.

WELLINGTON BRINK
EDITOR

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SOIL CONSERVATION

CLAUDE R. WICKARD
SECRETARY OF AGRICULTURE

HUGH H. BENNETT
CHIEF, SOIL CONSERVATION SERVICE

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SURVEY TELLS CONSERVATION NEEDS OF NATION

BY THE EDITOR

For the first time in history a practical "job sheet" is available to American farmers. It outlines, area by area—and eventually will outline farm by farm—the soil conservation practices that must be put on the land to assure maximum farm production at minimum soil loss. It is the result of a year's survey by several hundred trained technicians of the Soil Conservation Service, a survey which Chief H. H. Bennett says is fast nearing completion.

Almost half a billion acres in the United States are suited to crop production, after the exclusion of some 40 million acres of cropland that should be permanently retired. This great bulk calls for extensive and intensive soil conservation measures. It includes potential dust bowls, vast flood inducing watersheds, great expanses of thirsty soils that require water-saving measures, and wet soils that must be drained. The survey spotlights a sleeping farm giant that is only partly functioning, that is misapplying much of its energy, that is idling to a surprising degree, that lacks the full armor to defend itself against bristling attacks of wind and rain.

What are the immediate—and the ultimate—needs of this land we defend? The answer lies in this tabulation of figures that have been rolling in through many months—from New England and the deep South, from the cut-over areas of Wisconsin and the plains of Texas, from the wheat fields of Washington and the citrus groves of California. Farm by farm, county by county, state by state, comes the blueprint of a rural America that can be made fully productive and soil-secure by the science of soil conservation.

More than 95 million acres, for example, call for terracing. Nearly 122 million acres demand contour planting. The wide ribboning known as strip cropping belongs on upward of 90 million acres. Cover crops should be laid across 33 million acres. Irrigation water should be led down the furrows of nearly 11 million acres.

Here's a relatively Lilliputian item: pond management should be invoked on 720 thousand acres. And here's one of Brobdingnagian dimensions: 400 and more million acres of grassland desperately need proper stocking.

Out of 59 standard soil conservation practices, 23 were selected as being of prime importance. Each of these 23 major practices directly increases crop production and is urgently needed now as a war measure.

Cutting the whole new pattern indicated by the Soil Conservation Service survey will entail a staggering outlay of money, technical personnel, labor, machinery, fertilizers, and seed, it is freely admitted by Dr. Bennett. It will take years to do the entire job, he says—but even the begin-

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nings already made have paid rich and immediate dividends. Major war crops have already responded with 20 percent increased yields, where soil conservation measures have been applied.

In 1942, for example, soil conservation practices put on 10 million acres accounted for an increase of nearly 34 million pounds of peanuts and more than 37 million pounds of beef or beef equivalent. Eleven other major war commodities paid comparable dividends from soil conservation: wheat, soybeans, corn, hay, cotton, flaxseed, dry beans, cottonseed, potatoes, grain sorghums, field peas.

With the hungry millions of the world waiting to be fed and clothed, with millions of fighting men to be amply supplied on every front, soil conservation practices have been spread in 1943 over 27,000,000 acres. On the basis of experience, the Soil Conservation Service is able to predict startling increases in this year's crops because of these practices—boosts in yield aggregating 22,664,000 bushels of wheat, 1,580,000 bushels of soybeans, 17,889,000 bushels of corn, 4,013,000 bushels of potatoes, 91,142,000 pounds of peanuts, 100,941,000 pounds of beef, and similarly impressive gains in other commodities.

Records of the Soil Conservation Service indicate that when the new farming methods are properly applied to an average acre of corn land, a 7-bushel increase in yield can be anticipated. That's the immediate dividend—it follows right along the very first year.

If every pasture now grazed by Queen Cow were to be properly assigned, planted to the right grasses and legumes, worked into a rotation chart, given what lime and fertilizers it requires, it is highly doubtful if the rationing of butter, cheese, and other dairy products would ever be necessary. No less than 240 pounds of milk would be added to the yield of each milk-producing acre in the land by invoking an intelligent soil-conservation program.

The agency's studies show that crop yields everywhere respond promptly to a soil-conservation system, whether beef, cats, hay, cotton, flaxseed, soybeans, or other commodities are involved.

The new survey charting actual conservation needs for the United States is based on strict adherence to land capabilities. This yardstick "land capabilities," including the term itself, is of relatively recent origin. It constitutes a departure from the former conception of what a farmer needs to know about his land. The Service, through its land-capability maps, now provides a farmer with utilitarian classifications of his land according to a framework of physical factors. Uses of land—now indicated by a series of eight numbers, and as many colors—are determined by soil, slope, erosion, and climate. Uses are of four main categories—crops, grass, woods, and miscellaneous.

The new conservation-needs survey is a translation and a summary of what it will take to convert every bit of land to its safest, most profitable, and most efficient form of production. In assigning roles, the survey places continuing productiveness second only to immediate productiveness for war purposes.

In November Thomas A. Hester tells the story of a man's faith, hopes, and plans—how Señor Antonio Matos transformed his Puerto Rican farm from a loser to a winner. "It is pleasant to hear the jingle of coins from the sale of the vegetables," says Señor Matos.

A LATIN-AMERICAN STUDIES SOIL CONSERVATION

BY ROBERT E. ADCOCK

In the picture above, we see at the left Jader T. Rezende, fiber crop specialist of the Brazilian Ministry of Agriculture, Rio de Janeiro; right, Clark Hardenson, rancher 7 miles northeast of Beeville, Tex. On Hardenson's 4,000-acre ranch de Rezende learned how Rhodes grass is controlling soil erosion and increasing beef production.

A YOUNG EXPERIMENT station superintendent in the State of Pernambuco, Brazil, received an air mail letter from his chief. Would he be interested in a scholarship to study soil conservation with the Soil Conservation Service of the United States?

Sure, he wanted to go. He had read about the Soil Conservation Service, and he had observed the need for conservation measures on the lands of Brazil. He also had a burning desire to know first hand of the U. S. A.

More than six months ago he left his home country. What has he done? What has happened to him?

To start with, he went by airplane from Rio to Miami, thence by train to Washington. In 14 days at Washington he met Dr. H. H. Bennett and other officials of the Department of Agriculture, and studied English. He learned the names of foods, wearing apparel, and other essentials. English was a peculiar language, he thought. To save his soul, he could not flip a T from the back of his front teeth, or roll an R quite round. While he has not yet learned to touch a T just right or round out an R to perfection, his English has improved and he has developed many new abilities in the art of soil conservation.

From Washington he journeyed next to Fort Worth. In the office of the Soil Conservation Service there he learned about regional organization and the functions of the technical and administrative divisions. He acquired an over-all picture of the operation of soil conservation districts. Conservation moved slowly. He explained to staff men some of his country's conservation problems. A photographer took a picture of him with the regional conservator. A report of the trainee's work was published in a Fort Worth newspaper. He began to realize that his study meant more than just his own professional improvement. He began to feel his responsibility for carrying back to his country not only technical knowledge and skills, but also knowledge of the social and economic conditions that permitted such a great movement as soil-conservation districts to develop as it has here in the United States.

From Fort Worth, the regional training officer took him to a very small town in south Texas. His first reaction was, "What can this town have?" It was so small and so different from the large towns he had visited. The office was over the bank—a not very good office. The training officer, the work-unit leader, and the trainee sat down at a long table. They talked together about the trainee's trip, his native home, and the contrasts between countries. Soon the conversation turned to business. It was very difficult for him to follow. He could tell, however, that it

EDITOR'S NOTE.—The author is Regional Training Officer, Soil Conservation Service, Fort Worth, Tex.

was about his future in the work unit. The other men were reviewing the regional Latin-American training program, and discussing ways and means of applying it. He received a copy of the program. Major points were summarized on the front page about as follows:

I. Over-all objective—To develop in Latin American trainee the abilities necessary to carry out a complete and coordinated program of soil and water conservation; and to provide him with the experiences that will aid him in the pursuit of a satisfying life.

II. Probable time to be spent in the work unit—6 months.

III. Problems in which training will be provided.

- A. Acquainting the trainee with the country, the work unit area, and the office surroundings.
- B. Acquainting the trainee with the functions of other agricultural agencies—especially those related to soil conservation districts.
- C. Acquainting the trainee with Service objectives and organizations.
- D. Acquainting the trainee with the organization and operations of a soil conservation district.
- E. Developing the ability to make a conservation survey.
- F. Developing the ability to use land capability tables.

The man with the uplifted arm is Paulo P. P. de Melo, professor and director of Instituto de Pesquizas Agronomicas, Recife, Pernambuco, Brazil. The man with the big smile, in the center, is Jader T. de Rezende, inspector, Section of Textile Plants, Brazilian Ministry of Agriculture, Rio de Janeiro. The man at the right is J. M. Ruhman, owner of the farm; he is watching while de Melo and de Rezende check a terrace he built as part of the soil and water conservation system he is establishing with help from the Karnes County Soil Conservation District and the Soil Conservation Service.

- G. Developing the ability to assist a farmer make a farm conservation plan.
- H. Developing the ability to assist farmers in establishing and maintaining the major conservation practices used in the district.

He left this work unit recently. Here are some of the things he did before leaving.

Six weeks were spent with a soils surveyor. The first day, he relates, they mapped 500 acres, the second day 1,000 acres, and the third day 1,500. They dealt with slopes, soils, degrees of erosion—all correlated to land capability. ("I think every agriculturist needs to *do* before he can *do much good*," the trainee remarked.)

Our Latin American friend studied at night, and he studied in the field all day. After six weeks of this, the soils surveyor gave him two aerial photos covering about four square miles and asked him to make the conservation survey by himself. He mapped these four square miles and the surveyor said that but for minor differences they were as he would have done the job himself. The trainee plans to take copies of the two back to Brazil with him, as a pattern to use in his work.

His experience in farm planning and practice establishment were intermingled over the remainder of his stay at the work unit. He accompanied the work unit leader on the planning of 10 new farms and in making adjustments in the plans of 20 farms. He actually started and completed four farm plans under the guidance of the farm planner. He learned to plan and establish a complete terrace system, including individual outlets and designed channels. He considered himself a member of the work unit family. Although he was on a training scholarship he helped the engineer and the farmer shape outlets, construct terraces. He helped the range surveyor make ranch plans. He had a desk assigned him in the office. He had pencils and other supplies, government bulletins, and a desk full of reference books. Farmers who dropped into the office sometimes went to his desk and discussed conservation, his country and the "peculiarities" of the farm people of the U. S. A. as compared with the farm people of Brazil.

He attended supervisors' meetings. The supervisors told him about their work. He was greatly impressed with the businesslike way in which the farmers supervised the operations of the district. He visited supervisors' farms and their families. On numerous occasions he was invited to attend farmer meetings. When he left the district, the supervisors presented him with a beautiful billfold on which was engraved his name and the name of the soil conservation district. This he treasures.

Conservation farming plans are made on the land itself by Latin Americans who are receiving training from the Soil Conservation Service. This is on the J. M. Ruhman farm a mile northeast of Kenedy, Tex., in the Karnes County Soil Conservation District. Left to right—W. J. Wooley, tenant; J. M. Ruhman, farm owner; Paulo P. P. de Melo and Jader T. de Rezende, both of Brazil.

He became acquainted with the town people—bankers, merchants, other agricultural workers, ministers, physicians, teachers. He read the newspapers—war reports and comic strips, was interested in each part as much as any North American. He went to church and to the better picture shows. He learned to enjoy our foods. He learned the better brands of clothes and accessories. He made frequent week-end trips to San Antonio to visit other South Americans. He thinks San Antonio is the best city there is.

Now he is to observe more extensively the work of the Soil Conservation Service. He has as a guide the pattern of conservation principles which were woven together while at the work unit. He is now to study experimental methods on a research station, and to observe conservation under different climatic conditions. When this is over, he will have gone a long ways toward attaining the ability to assist farmers in carrying on a complete and coordinated program of soil and water conservation.

While this article deals with one of the trainees, it is typical of the trainees generally—the student guests who are preparing for leadership in the great campaign to safeguard and make fully productive the agricultural soils of the Western Hemisphere.

SLOPE LENGTH INTRODUCED AS "FOURTH DIMENSION" IN FARM PLANNING

BY HARRY H. GARDNER

C. L. (SID) PARISH and John S. Glass, zone technicians of the Soil Conservation Service, have developed a new factor—a "fourth dimension"—which enables farm planners to eliminate much of the guesswork in determining the effectiveness of contouring, strip cropping or terracing on a particular field under any one of a number of rotations.

The "fourth dimension" is length of slope. Under the Parish-Glass formula for determining the correct rotation and the right conservation practice, length of slope is taken into consideration along with soil type, amount of topsoil lost and percentage of slope.

In eastern Iowa and Illinois, where the two men have introduced the new system, farm planners have prepared tables and charts showing what rotation and what particular practice or combination of practices are needed to control erosion effectively.

EDITOR'S NOTE.—The author is Chief, Agronomy Division, Soil Conservation Service, Milwaukee, Wis.

In the past recommendations for rotations have been based mostly on soil type, degree of slope or use capability of the land with or without conservation practices. Length of slope has been largely ignored. Such recommendations have value as a guide to over-all farm planning, but are of little use when applied to an individual farm or to a particular field. Consequently, farm planners set up their own individual guides which varied widely because they were limited largely to personal observations and experience.

Parish and Glass turned to the work of the soil conservation experiment stations at La Crosse, Wis., and Bethany, Mo., for a clue to a method of eliminating some of the guesswork. The stations had determined soil and water losses for crops and for rotations under a few specific soil and slope conditions. From these data the stations had prepared graphs showing maximum length and degree of slope combinations for a rotation with different conservation practices.

The rotations, soil types and physical conditions that the stations had worked with were few, compared with the number a farm planner encounters on every farm.

Using the graphs prepared by Orville E. Hays at the La Crosse station and Dwight D. Smith at Bethany, Mo., the zone team developed a method of extending and applying the experimental findings. They used the same reasoning and some of the same formulas that are used in applying experimental plot data to field use. So far the method has been applied to approximately 100 individual soil types and 27 different rotations.

With the assistance of conservation surveyors and farm planners, erosion rating factors were developed for various soil types. These factors make possible the application of the experimental results to the various physical conditions and rotations.

Conservation surveyors who helped set the erosion rating factors included Harold E. Grogger and Russell C. Kronenberger of Iowa, and Eugene M. Steeley, Donald W. Hopkins, Charles E. Downey and Raymond R. Irwin of Illinois.

District personnel who also assisted and who were among the first to develop the method for field operation included George E. Summers, Gerald M. Schroeder and Oris H. Randolph of Iowa; Sterling E. Myers, Arlee C. Hanson, Jewel E. Thacker, Hampton H. Long, Arthur F. Moratz, David O. Carter, Richard L. Conlin, Frank J. Biba, Joseph B. Davidson, and Harry E. Gearhart of Illinois.

Here's how the procedure aids the farm planner. He has a field of Clinton silt loam, with a 4-percent slope and a length of 600 feet. He wants to use a corn-small grain-meadow-meadow rotation and would like to know what mechanical practices are necessary to reduce soil losses to a reasonable minimum.

So he consults his chart on that soil type and finds that Clinton silt loam has an erosion factor rating of 0.85 compared with Fayette silt loam.

With the basic length of slope table the planner finds that contour operations with the rotation he desires to use on Fayette silt loam would be effective for a slope length of 330 feet.

But under the same conditions Clinton is a more erodible soil than Fayette, as reflected by the factor 0.85. Applying the factor (330 x 0.85) he gets 28[illegible] feet, indicating it would be necessary for the farmer to apply additional protection on the 600-foot slope. In this instance, the planner again consulting his tables, finds strip cropping is needed to handle the situation.

Some farm planners have gone a step further than the preparation of tables. They have plotted the information in graph form, making it readily usable with few mathematical calculations. In determining various rotations and practices required, the answers are read directly from the composite graphs.

REPORT ON BOND PURCHASES

H. H. Bennett has commended the employees of the Southeastern Regional Nursery Division for having achieved the highest record in purchases of War Savings Bonds through the pay roll savings plan for July.

In his letter the Chief said, "The objective of our military leaders and our armed forces is the unconditional surrender of the enemy. That is also the objective of every one of us working at home. To do our full part in achieving it, we must now improve on our present pay-roll allotments. We must make every necessary sacrifice to increase our allotments and we must continue to purchase War Savings Bonds right up to the day of final and complete victory. This is an essential part of the winning of the war. Relaxation in our participation in the pay roll savings plan, due to overconfidence or to complacency, may postpone victory and cost us the lives of thousands of our boys.

"I extend to each of you the highest praise and warmest congratulations on your outstanding contribution to the war effort to date. I anticipate an even greater contribution in the future—because I know I can count on each of you and because the need is so great."

During July the employees of the Federal Crop Insurance Corporation led all other bureaus and agencies of the Department in the War Savings Bond campaign by allotting 13 percent of the total pay roll for bond purchases. Soil Conservation Service was second with 11.4 percent allotted.

—John S. Fickling.

Bicolor lespedeza is not only a field border plant easily established by direct seeding—its seeds are eaten more by bobwhite than any other and its flowers are proving the source of a light, mild honey.

LUMBER FOR FARMS— FOOD FOR WAR!

BY D. HARPER SIMMS

Above.—Darrell Johnson, sawmill operator, left, and Bob Lundell, Vernal high-school student, roll a log over to the sawmill. Several high-school boys worked at the mill during their summer vacation.

THERE'S A SOIL conservation district up there ı northeastern Utah that takes in Uintah, most of)uchesne, and part of Wasatch counties. It's the ırgest district of its kind in the United States—omething more than 5 million acres in all. It was rganized back in 1940 when the farmers and ranchrs of those counties got together and voted to estabsh a soil conservation district as a means of tackling heir soil problems. They called it the Uintah Basin)istrict, and it takes in everything from high, wellatered mountain country down to arid range lands, vith all the degrees of climate, soil and crops in etween.

One of their big projects was improvement of their rrigation systems. Around 200,000 acres in the disrict are under irrigation, and it was on those lands hey knew they could most quickly get increases of ital war crops.

One of the great needs was for better turn-out tructures—the boxes and gates through which irriation water is released from ditch to field. Good urn-outs need to be made of lumber or concrete and o designed and installed that they will prevent rosion and increase production by controlling the low of water, and will not be undercut or washed ut.

Both lumber and concrete, under war conditions, vere hard to get. Lumber was preferred, because it was cheaper and because the structures could be moved in case of need.

Early in November last year, the district board of supervisors met to discuss this conservation and irrigation improvement project. At least 200 new turnout structures were needed—probably more—ranging from small to large. Someone advanced the idea of prefabricating these boxes, so that the district might avail itself of whatever labor might show up during slack winter months. The boxes would then be sold to farmers. That seemed like a good idea, so the supervisors asked the district conservationist to draw up some designs.

Where get the lumber? Checking into the matter, the supervisors found that all the local mills in the forests of the Uintah mountains had closed for want of labor and machinery or were tied up in production of lumber for war-plant construction. No timber was being sawed for agricultural use, nor could any be obtained.

Never had the need for lumber been greater on the farms of the vast Uintah Basin. Farmers had been called on for greatly increased poultry and livestock production—and that meant new chicken houses, pigsties, shearing pens, barns, and corrals.

Someone had a bright idea. Why should not the farmers themselves saw their lumber as a soil conservation district enterprise? The irrigation struc-

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Editor's Note.—The author is Chief, Division of Information, oil Conservation Service, Albuquerque, N. Mex.

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tures were part of their conservation program, and everybody was aiming at increased production.

Nearby Uintah Indian Reservation had done the same thing. It had established a small mill and was cutting lumber for Indian needs. So the soil conservation district supervisors talked it over with the Forest Service, the Soil Conservation Service, the Agricultural Adjustment Agency, the county agent, a local banker, and others who might give help and advice.

The Forest Service agreed to select trees and sell the district the timber needed. Since it was for farm use, the price was put at $1 per thousand, in contrast to the usual $2.50. AAA said payments would be made for installing the irrigation structures if they met AAA specifications. SCS said the district conservationist who had helped plan the irrigation improvements would help plan the project and supervise construction of the irrigation boxes.

The project started. Ten thousand feet of pine were purchased at the outset, and four experienced men were hired from the district to do the logging. Mid-winter snowstorms caught the logging crews, who had to ski out on occasion on 3 to 15 feet of snow. Darrell Johnston, veteran sawmill operator, contracted to saw the lumber which was being logged.

As news about the project spread through the district, orders began to flood in. Two orders, for example, for 15,000 feet, came from turkey growers who were badly in need of poultry sheds. The supervisors soon saw that their original estimate of 10,000 feet would fall far short of demand. Another 50,000 feet and later another 113,000 feet were contracted, until a total of 173,000 board feet were included in the purchase.

Roads into the high mountain country where the lumber would be sawed proved to be the next problem. Ordinarily the State Road Commission does not open the highway from Vernal to Green Lakes until mid-May or June. The district tried in vain to open the snow-blocked roads. Finally, an appeal went to the State Road Commission and equipment was sent to the rescue on the first of April. By April 8 the road was opened and the mill moved in. On April 12 Darrell Johnston sawed through the first log. On April 16 the first truckloads of lumber splashed and skidded down muddy mountain roads to Vernal, where the prefabricated irrigation structures were to be built.

Sight of the first truckload of lumber on the streets of Vernal caused a great stir, and more and more requests for farm lumber, as well as for irrigation structures, poured into the district office.

Labor to operate the mill proved a problem, bu
local people were found to get the job done. Firs
Indians were used. Later, when they became avai
able, high-school boys from Vernal moved into th
sawmill camp and helped wrestle logs and lumber.

By April 20—just four days after the first truc
load of lumber had come down the mountain—th
irrigation boxes were started in the storage lot of a
abandoned CCC camp at Vernal. Carpenters hire
by the district, following designs which met AA
specifications, began turning out checks, drops, dou
ble turn-outs, weirs, and other badly needed pieces o
irrigation equipment.

These structures are today being sold by the di
trict to farmers who in turn can defray about
percent of their cost through AAA payments. Th
district, in turn, will realize a small profit which wi
go into its equipment fund or into funds which wi
finance further lumbering operations. Farmers in
stall the structures in accordance with their respe
tive farm conservation plans prepared with the he
of the Soil Conservation Service. These incluc
land leveling, nonerodible ditch grades, and oth
soil conservation and production practices.

The first structure was installed on a farm belon
ing to J. V. McLea at Roosevelt. A large doub
turn-out built of this district-produced lumber ar
treated with creosote to prolong its life, cost McLe
about $170. But with its help, he can now, for th
first time, make use of waste water which will in
crease his crop and pasture land by at least 50 acr
in 1944, utilizing water which has previously go
to waste and which, if it could be purchased at loc
water-rights rates, would cost $2,400 plus about $3.0
per year for maintenance and debt retiremen
assessments.

This is waste water, of course, and as a matter o
fact, additional water rights are not for sale in th
community. But had McLea had the opportunit
to purchase this amount of water (about 1,200 acr
feet annually) he would have paid nearly $10,00
over a period of 20 years.

With the 1,200 acre-feet of waste water, the stru
ture gives McLea enough water that he could, if h
wished, surrender his present water right, wor
$2,400 in cash.

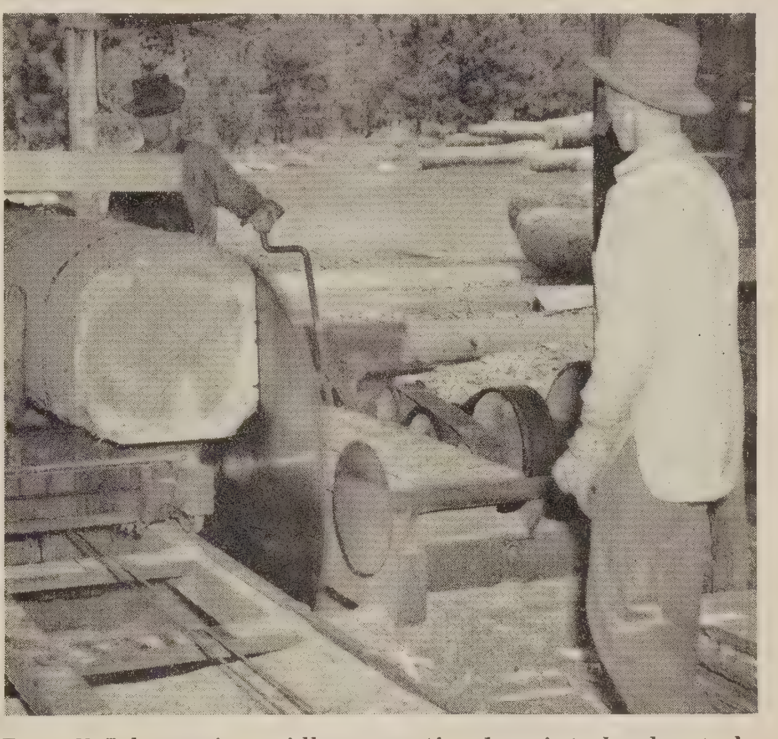
More important is the fact that previous idle lan
can now go into production of crops needed to w
the war.

The spirit of cooperation evidenced by Uinta
Basin communities when they voted in the so
conservation district, was borne out in the lumb
project. The assistance of state and federal gover
ments has been mentioned. The matter of financin

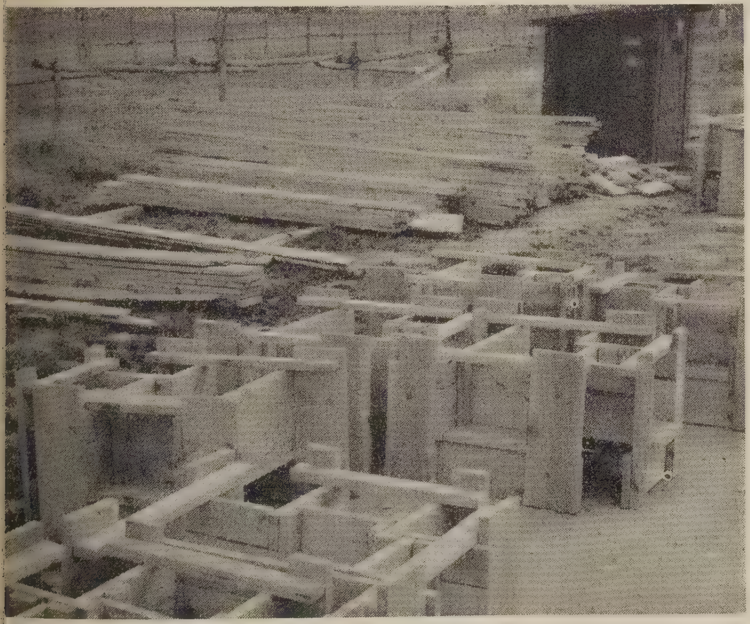
This double turnout is in operation on the J. V. McLea farm near Roosevelt.

as no small problem, for the district's treasury alance was but $300 when the project began. A ocal banker, who believed in the idea, advanced ore than $2,000. Lumber sales soon brought in a eady revenue which not only has continued to nance the sawmill operation, but which by now has ist about retired the district's note at the bank.

The district supervisors—Leon P. Christensen, hairman, Vernal; Chester H. Hartman, secretary, Iount Emmons; Davis Morrill, Tridell; John H. ook, Roosevelt; and Lin Ross, Arcadia—are due n immense amount of credit. Harry K. Wood- ard, district conservationist, and other members of he cooperating agencies, worked without stint to ake the project come through successfully with ains for food production, for soil conservation, and or better farming now and in years to come.



Darrell Johnson is rapidly converting logs into lumber to be used by Uintah Basin farmers. Standing with back to camera is Otis Weeks, Vernal high school lad.



ome of the prefabricated boxes ready to be installed on Utah farms.

REPORT ON DISTRICTS

As of August 15, 1943, 919 soil conservation districts, covering approximately 533,048,000 acres, had been established in 42 states which have enacted a soil conservation districts law. These districts include approximately 1,854,023 operating units and 2,415,202 farms In addition to these 42 states, a soil conservation districts law has been enacted in Delaware, Rhode Island, and Missouri.

The Department of Agriculture has entered into memoranda of understanding with 841 districts covering approximately 489,426,000 acres.

A BROADWAY VIEW OF SOIL CONSERVATION

BY EMIL CORWIN

Most of my adult life has been spent not more than three subway stops from Times Square, a region of doubtful agricultural importance. This fact is not the best recommendation for a by-line article in *Soil Conservation* magazine, but now that I am in soil conservation work myself, it might be of interest to some to know the conservation views of a New Yorker from the perspective of Broadway and 112th.

Where I come from soil is something to be seen at an excavation. Food is what you pick up at the grocer's two doors down or at the fruit stand across the street. Where or how it is grown, or how it got to upper Broadway, nobody gives a hoot. When it comes to food, New Yorkers are in the take-it-for-granted school.

So I must confess that when I came to Washington, soil conservation seemed an impersonal thing, like World Peace; big and important and necessary, but impersonal nevertheless. I have a theory as to why it seemed that way to me. When I was an agricultural college student the conservation movement was about where radio was in the crystal-set stage, though I did feel that soil conservation, like radio, was here to stay. The dust storms were yet to come, the Soil Conservation Service was almost a decade away, and erosion was a word expensive dentists use to describe simple cavities. That is approximately where I left soil conservation when I moved to the big city. All the time I was there soil conservation was growing up. I wasn't to realize how vast and important the movement had grown until I shook the mazda from my eyes and came to Washington. And if that doesn't explain why soil conservation seemed impersonal to me at first, don't hold it against the Massachusetts Agricultural College. It didn't take me long to catch on when I got here, however.

By the time I had learned that the Froid demonstration project had nothing to do with psychoanalysis and that it is not proper to say "Gesundheit" after lespedeza and kudzu, soil conservation had become a very personal thing to me. I needed no long indoctrination to realize that in soil conservation rested my own destiny and that of my country's.

Erosion was to me what a bogeyman with horns is to a neurotic child. I never imagined that more than 200 million acres of once-productive cropland in the United States were already ruined or seriously damaged, and that an additional half million acres of land are being ruined by wind and water erosion every year. Nor did I realize that one inch of vital topsoil, that it takes Nature hundreds of years to make, can be swept off by wind or water in just a few days. Are we going to lose our No. 1 resource? Are we going to starve? I got no comfort from the experts.

North America is drying out, said Paul Sears.

If topsoil is entirely washed or blown away, living standards are lowered, Russell Lord wrote.

We are threatened with national extinction, G. V. Jacks warned.

The American continent could turn into the Sahara of the Western Hemisphere at the present rate of soil and water depletion, Raymond Gram Swing reported.

Critical food shortages within 50 years are possible unless nations push ahead on soil-conservation programs, Dr. Hugh H. Bennett predicted.

Empires have perished by soil depletion as well as by the sword, again Dr. Bennett said.

Land under the plow is wasting away by erosion faster than soil is being formed, cautioned W. C. Lowdermilk.

We have ruined more land in the last 50 years than Japan uses to support her population of 60 million, according to J. Russell Smith.

Well, you can't hear talk like that and not be aroused, no matter who you are or what part of America you come from. This is your land. You can do something to save it. It is not enough to defend our shores from enemy invaders. We have got to defend the whole land from the enemy in our midst, the arch saboteur of all time—Erosion.

Before you realize it, you are talking conservation to all comers—in the office, at home, and in public places. You don't talk about it casually, as you do the baseball scores. Your voice rises higher and higher, treble and agitato, as though your wife or your city friends or whoever you are addressing is responsible for the destruction of our good croplands.

With me, the emotional gamut ran from F to A—from Fear over the dangers of erosion to our way of life to Admiration for the way conservationists in their speech and writings have humanized the problems of soil conservation. Whatever thoughts you may have had about dull reports coming out of Washington agencies were soon to be dispelled on reading and listening to the language of the conservationists.

To soil conservationists this productive soil we are asked to preserve, maintain, and build up for our prosperity and security is not an inanimate matter, but a living, vital thing. Handle it with care, as you would your own body. Give it rest, nourishment, protection, variety. Soil is like the human body. When topsoil goes, the land is *skinned*, *wounded*, or *scarred*. The land can *bleed* to death and it can be *healed*. Gullies are the earth's *cancer*. Erosion is a contagious *disease*. Stubble mulch is *bearded* soil. Soil and water, the earth's *placenta*. This is the way the conservationists talk. The soil becomes real and, alive, and whether you were born to it or not, you acquire a love and affection for it that is not easy to explain to the boys back in Radio City.

I was impressed by the facility of conservationists to strike phrases to kindle the imagination, to bring home to Americans the importance of soil conservation to their existence and happiness. These lines come to mind:

"Contouring is a discovery as great as the discovery of the wheel and fire. It has to do with human destiny."

"Every farmer has got to take care of four city families."

"The principle of conservation ranks along with education in general and religion in general as one of the great forces through which we can reconcile liberty with unity."

This is dynamic talk, straight from the shoulder, and it makes me feel pretty good to know that I am a part of the movement. I remember my satisfaction in reading that conservation farming not only protects and improves the soil but increases crop yields per acre by 20 percent and more, and with little or no additional labor, machinery, and fertilizer. Here, I thought, is a natural for a Believe-It-or-Not.

Soil conservation is the answer to increased food production. It has a vitally important role to play in winning the war for the United Nations and in building a post-war world of a greater abundance and opportunity.

I'm going to pass the word around Broadway.

BETTER IRRIGATION—KEY TO BETTER CROPS IN THE SOUTHWEST

BY J. G. BAMESBERGER

IT WAS JUST A YEAR ago, in September 1942, when the "once in a hundred years" rain struck northeastern New Mexico. When the storm had passed, every irrigation system in the vicinity of Springer was out of operation. Nine storage dams were breached. Two diversion dams were gone. Four main canals were broken in numerous places. Unless the damage were repaired before the next irrigation season, approximately 22,000 acres of irrigated land would be out of cultivation.

Farmers realized that they could repair only a portion of this damage through their own efforts. Immediately, therefore, they requested aid from the Eastern Colfax Soil Conservation District. The district, in turn, asked the Soil Conservation Service to provide all assistance available.

Technical services and some heavy equipment were provided, with the result that seven storage dams were repaired to the satisfaction of the State engineer, one diversion dam was rebuilt, and three main canals were repaired. All but 1,100 of the 22,000 irrigated acres were back in full production this year.

This is typical of the group irrigation work undertaken in Region 6. Storms, deterioration, and lack of maintenance all take their toll of irrigation structures; there are always some very good farm lands threatened with retirement because of lack of water.

Modern irrigation agriculture in this country started almost 90 years ago with the settlement of Utah, and spread rapidly to surrounding states. Structural works undertaken in those early days necessarily were built solely from readily available materials, and, judged by present standards, were of a makeshift or inferior quality. Except in the more favored localities, repairs and replacements continued to be of the same poor quality, because of financial exigencies, and so we find the agriculture of large areas in the Southwest dependent for existence on unreliable, inefficient works which frequently fail at the time they are needed most.

A reliable water supply is the key to production out here. In most parts of Region 6 no irrigation water means no farming. Failure during the irrigating season means reduced yields or even no crops at all. It is no wonder that water supply is the problem uppermost in the minds of the farmers. There are now approximately 1,048,000 acres of irrigated lands in soil-conservation districts in Region 6. Requests from soil-conservation districts have resulted in the Service personnel of this Region providing, during the 1943 fiscal year, the necessary technical assistance for the repair or construction of 26 storage dams, diversion dams, or canal headworks, and repairs or improvements on 27 main canals.

In no instance were such services granted unless it could be shown that the completion of the works would provide a substantial increase in essential food production. Such increase was obtained through assuring a full crop in areas where partial yields had prevailed, by increasing the acreage under irrigation, or by restoring water to previously irrigated land that otherwise would not be farmed. Ninety-seven thousand acres were benefited by the works completed in time to be utilized during the 1943 irrigating season.

An estimate of the increased production expected was made for each project by experienced technicians. Total increases in crop production from these group irrigation jobs amounted to the total yields from 42,500 acres of irrigated land. This is an increase of a little more than 1 percent in the food production for 1943 from all the irrigated cropland in the States of Arizona, Colorado, New Mexico, and Utah. These figures do not take into consideration the improved irrigation and management practices adopted on the farms benefited—items which in themselves effect a decided increase in crop yields.

Notwithstanding the accent on group jobs completed the past fiscal year, Region 6 feels that its greatest contribution to the permanence of irrigated agriculture is in improvements made on individual farms. Installation of improved distribution systems and irrigation practices on individual farms has been keeping pace with the group jobs. Improved irrigation systems, better water management, and land leveling were accomplished on 90,000 acres during the past fiscal year. The estimated increased crop production is equal to the yields from approximately 20,000 acres of irrigated farm land.

The program for improving the use of irrigation water on the farm is based on three requisites:

(1) Know where the water is going.

(2) Keep the water under control at all times.

(3) Have a well-planned lay-out which fits the farm.

Editor's Note.—The author is Chief, Division of Engineering, Soil Conservation Service, Albuquerque, N. Mex.

'he block-furrow method of irrigation accomplishes an even distribution of water. This Arizona farmer is getting maximum use out of every drop.

Neither the farmer nor anyone else can determine whether good irrigation prevails until he knows just where the water is going, how deep it is percolating into the soil in all parts of the field, and how deep the water should penetrate in order to secure adequate irrigation, and how much is running off the lower end of his field as waste. To acquire this information, farmers are urged to make use of soil augers, moisture probes and shovels, and to time the rate of advance of the water throughout the entire length of the run. The need for changes in irrigation lay-outs, including lengths of runs, grades, methods of irrigating, changes in size of irrigating streams, and need for leveling, will all be indicated by such information.

The case of Guy Hafen in southern Utah is typical. Decreasing yields were puzzling this farmer until a moisture probe in the hands of a Soil Conservation Service technician revealed that he had been over-irrigating. "I didn't think it was possible to over-irrigate in this dry country," Hafen said. He is convinced that he has found his trouble, and plans from now on to check moisture penetration with a probe.

Unless water is kept under such control that a farmer can make accurate adjustments in his irrigating stream, it is impossible to apply the right amount of water uniformly across the entire field. Control structures, such as drops, checks, turnouts, spiles, etc., all have their place, and their proper use is encouraged by every available means.

One district, at Grand Junction, Colo. has gone into the business of manufacturing concrete turnouts, checks, and spiles and selling them to farmers at cost. The plant is unable to keep up with the orders. At St. George, Utah, a district owns a number of sets of forms for concrete turnouts and lends them to the farmers without cost. At Roosevelt, Utah, the Uintah Basin District has taken over the operation of a sawmill. Logs cut on the national forest are sawed into lumber and used in the manufacture of wooden division boxes, checks, and turnouts, which are sold to farmers without profit. Wherever improved irrigation structures are being used, farmers are growing better crops with less labor and at lower cost.

When need for a better irrigation layout or for improved leveling becomes apparent, the farmer is encouraged to make the improvements as opportunity and finances permit. If leveling is needed, he is advised to "rough level" whatever area he can afford, but at the same time to "finish level" a small portion of each field, which will serve as a pattern toward which he should work for the rest of the field.

Improved layouts require skilled technical assistance, but a point worthy of note is that proper lengths of runs and grades are determined by trial irrigations rather than by any rule. There is widespread interest in improved layouts, particularly in shortened runs and better land leveling. Lloyd Taylor, a Red Mesa, Colo., farmer, requested such assistance. The runs on his fields were shortened and waste water was eliminated. As a result, Taylor had sufficient water to grow a full crop on 301 acres, as contrasted to the 150 acres he had been able to irrigate before.

Land leveling has been paying big dividends to farmers in all parts of the region. In the Mesilla Valley, N. Mex., a 6-acre field on the E. J. Sterns farm required 13 hours to irrigate before leveling; it now takes one hour, and is producing fine alfalfa, whereas before the crops were hardly worth harvesting. In the same area, W. H. Brookerson saved enough labor and water charges the first year to pay for his leveling costs. Another Mesilla Valley farmer increased his cotton yields from one to two bales the first year after leveling.

At Safford, Ariz., M. J. Ferguson bench terraced his farm and installed concrete control structures. As a result, he was able to irrigate with one-third less water, to increase his production by about one-third, and to cut his irrigation labor in half. A farmer near Morgan, Utah, states that leveling has increased the value of one of his fields $50 an acre. In the San Luis Valley of southern Colorado, where approximately 1,200 acres have been leveled by district machinery, a 106-acre field that formerly required 5½ days to irrigate can now be irrigated in 20 hours. Although, 14,000 acres of irrigated land have been leveled in the Region during the past year.

The farmer's cropping practices, tillage practices, management program, and erosion problems all have a controlling influence on the farm irrigation lay-out and irrigation practices. For example, where a farmer is employing a grain-alfalfa-potato rotation, selection of the irrigation grades will be governed by the grades required to irrigate the potatoes with furrows and not the grades required for alfalfa and grain with border irrigation. This will require certain adjustments in practices for the border irrigation. Consideration must be given to the farmer's tillage equipment when breaking up a field with cross ditches to shorten the runs. If he is using heavy tractors, the runs cannot be made so short that they will seriously interfere with the use of such equipment. In the location of ditches, grades should be selected that will prevent erosion, or i

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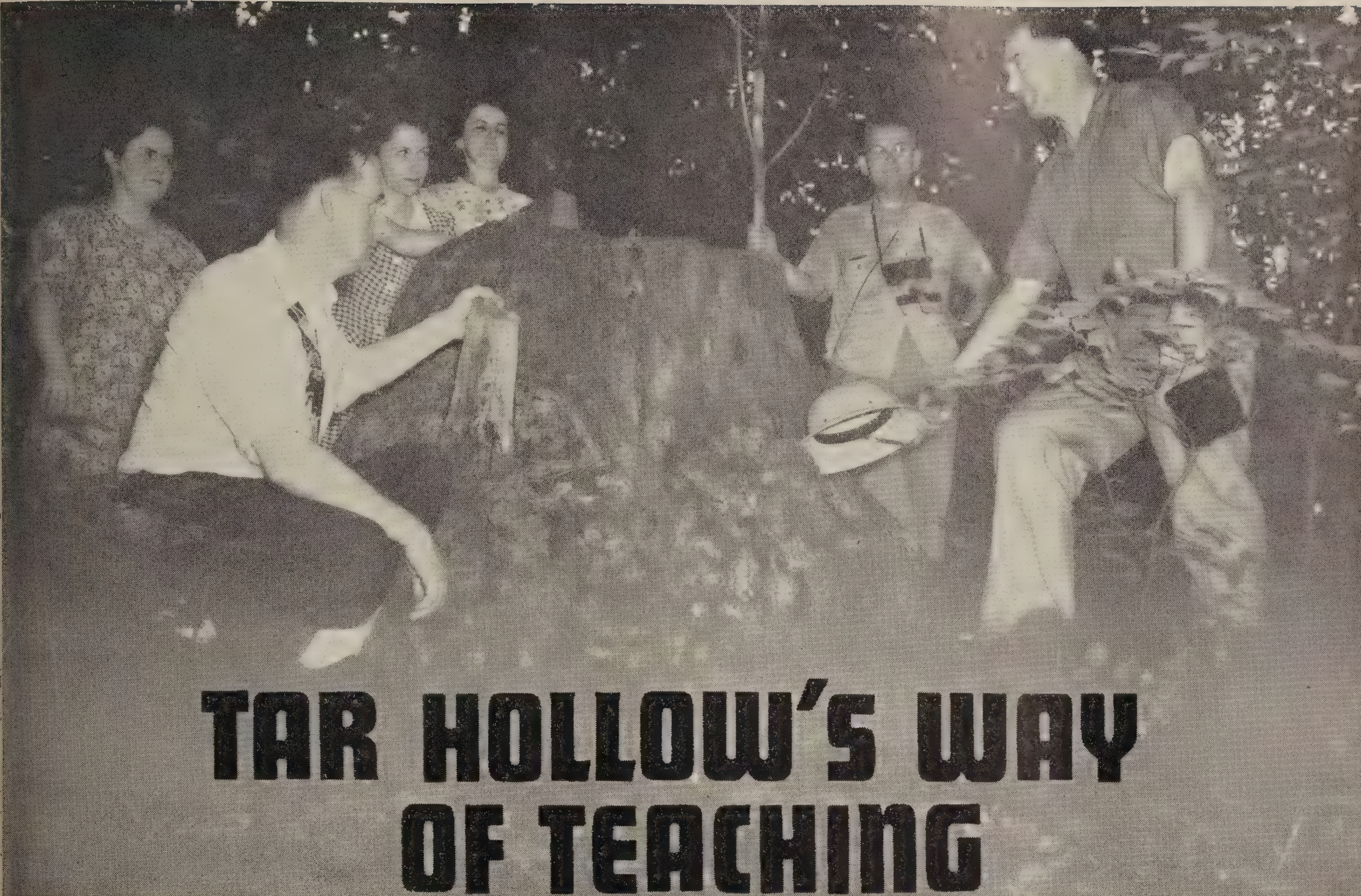

TAR HOLLOW'S WAY OF TEACHING

BY WELLINGTON BRINK

Above—Students of the conservation laboratory study the effect of sheet erosion in the once cut-over Ross-Hocking Forest. According to W. H. Barnes, at right, member of the laboratory's teaching staff, more than 18 inches of soil has been removed by erosion. The tree, only the stump of which remains, must have been more than 1,000 years old.

ANY a mickle makes a muckle. And many a tle towhead of today will make the great emocracy of tomorrow. How important, then, in l our post-war planning, in all our expansive talk future security, of National and international ograms—how important that we give considerabn to the towhead and the towhead's teacher and e whole educational approach!

Even now, school windows are beginning to open, vealing the world that is ours. Every time that ppens, concepts freshen, panoramas lengthen, perectives deepen, viewpoints sharpen. Science aps out of textbooks and test tubes, and finds tality and meaning in the promise of the land.

Teaching techniques undreamed of a short decade go are now being put to fair test. Some of these chniques already are pioneering paths to more ppy relations between Man and his environment.

One of the most exciting of recent educational adntures is that which has its setting in Tar Hollow. or several summers the State of Ohio has been fering to teachers what is perhaps this country's ost unique training in the natural sciences. It is nique because it recognizes ecological fundamentals. is unique because it whets to fine edge the student's capacity to observe, to correlate, and to arrive at deductions. It is unique because it challenges pupil rather than merely pedagog.

Tar Hollow, physically speaking, is a well-designed camp in the Ross-Hocking State Forest, eighteen miles from Chillicothe. It nestles in a rugged, wooded valley. The great lodge, flanked at either end by massive stone fireplaces, is the center of activities. Here classes assemble, meals are served, office records are kept, motion pictures find a screen. Here, too, are a library and a museum. Log cabins housing faculty and students perch on nearby hillsides. A five-acre lake bathes the foot of a long slope.

Tar Hollow labels itself a "conservation laboratory"—and it lives up to its label. Ollie E. Fink, laboratory director, fathered the idea. It was such a good idea that it immediately received the joint blessing and sponsorship of the State Department of Education, the Ohio Division of Conservation and

Natural Resources, and the Ohio State University. The laboratory carries an ample, topnotch staff of specialists in plant ecology, geology, animal ecology, nature study, and education. There are no textbooks, in the usual sense—the land itself is the textbook.

An annual feature of the six weeks' summer course is a conference on conservation, nutrition, and human health. This conference brings to a comparatively isolated spot many of the most brilliant minds of Canada and the United States. Novelists, editors, doctors, nurses, dieticians, farmers, get into shirt-sleeve discussions to the infinite delight and profit of the young men and women who in other seasons labor as teachers in grade schools, high schools, and colleges.

From New Hampshire came the conferees this year, and from Tennessee; from Michigan and California; from Washington and New York and Indiana. They came from Mississippi, too, and from Connecticut and New Jersey—came to talk of soil and water, of dust and mud, of food and malnutrition. They came to put the wasting world under a microscope. They came to search out measures that will help put a period to the conflict between Man and Nature.

This, said a metropolitan daily, was of National—yes, international—significance, comparing in grandeur of concept with the great food conference at Hot Springs, Va.

This, said Louis Bromfield of best seller fame, was the forerunner of "a long-range program involving every person in the United States . . . indicative of a revolution in psychological viewpoint, of a shift in educational emphasis . . . coming at a time when we are on the edge of feeling the great pinch, at a time when our standards of living are bound to go down and down and down, unless we take care of our land."

Hugh Hammond Bennett, chief of the Soil Conservation Service, supplied the hard mathematics. There are 4 billion acres of arable land, said he, that must be made to provide a sure and satisfactory living for the 2 billion people of the globe—and for the generations to follow.

"We must practice soil conservation and teach it to our children," he declared.

Dr. Bennett was not in too happy a frame of mind, having arrived fresh from an inspection of the flood-gutted Middle West, where a billion tons of soil had been torn from the land and where farmers had been robbed of $700,000,000 worth of capital assets by erosion.

But the Chief of the Service went on to hail the completion of soil-conservation measures on 50,000,000 acres, and, by a slide-illustrated lecture, to chart the job that must be done throughout the United States to make our agricultural land safe, efficient, and productive. By "fitting conservation measures to the land," soil conservation is revolutionizing crop production with an average increase of at least 20 percent, making an immediate and vital contribution to the winning of the war.

Other speakers included Director Fink, who discussed the "water pyramid;" W. D. Ellison, supervisor of the Northwest Appalachian Soil and Water Conservation Experiment Station who told of the importance of trapping raindrops in the fields upstream; Dr. William F. Petersen, author of the four-volume "The Patient and the Weather," who drew relationships between weather records and human behavior.

(Continued on page 92)

WHO'S WHO IN PICTURES ON OPPOSITE PAGE

1. H. H. Bennett, Chief of Soil Conservation Service; Don Waters, commissioner of Ohio's Division of Conservation and Natural Resources; Hon. John W. Bricker, Governor of Ohio.

2. John D. Detwiler, Professor of Applied Biology, University of Western Ontario, addressing a group of students and distinguished guests at the second annual conference on Conservation, Nutrition and Human Health.

3. Governor Bricker, Louis Bromfield, novelist and farmer; Mrs. Lois Francke, conservation chairman, Garden Club of America; Paul Sears, author and Professor of Botany, Oberlin College; Wellington Brink, editor of *Soil Conservation*.

4. Standing—Miss Claire Rothenburg, student at the laboratory, and Dr. Jonathan Forman, editor of the *Ohio State Medical Journal* and executive secretary of Friends of the Land; sitting—Dan Wallace, War Food Administration; Russell Lord, editor of *The Land;* David C. Warner, water conservation consultant, Ohio State Department of Public Works.

5. Canada, Russia, and the United States have a common enemy in soil erosion; Dr. Bennett and Dr. Detwiler discuss the conservation task with Mrs. Rosa Dembo, Russian-born Ohioan, between sessions at the Tar Hollow conference.

6. Away from typewriters, these two writers find a moment to smile, as they plan ways to teach soil conservation to the people of the land: Louis Bromfield, known for his books, and Gordon K. Zimmerman, information chief of the Soil Conservation Service.


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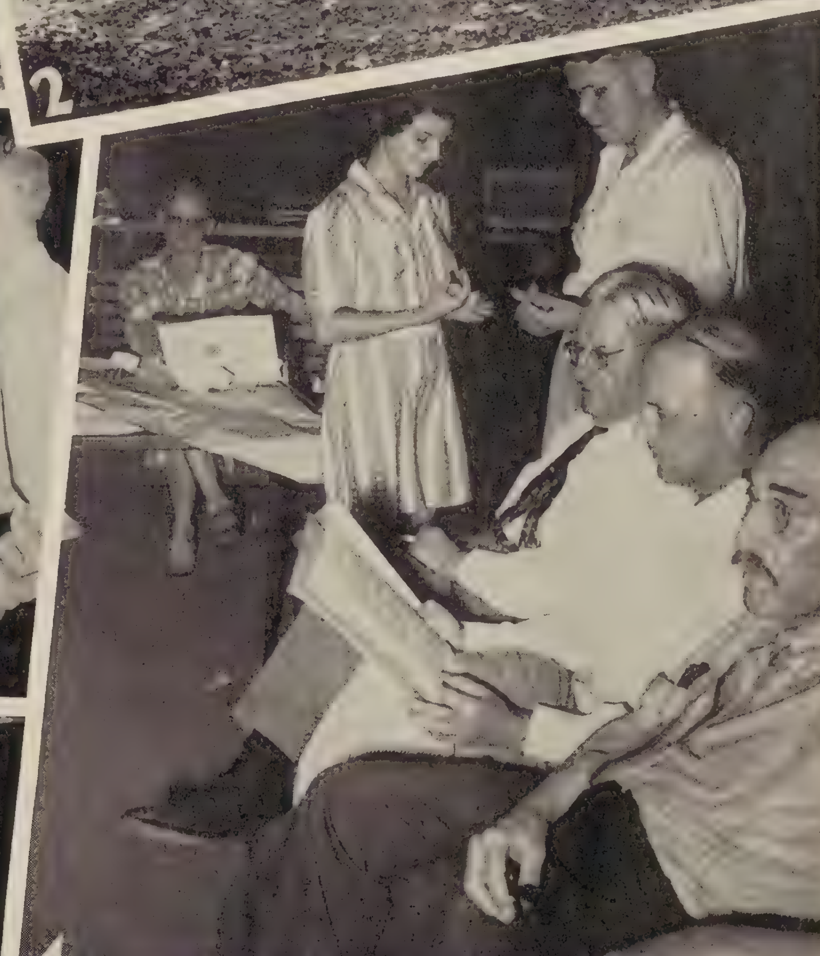
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Dr. William A. Albrecht, head of the soils department in the University of Missouri, reviewed plant research findings in the application of lime to soil. Dr. George M. Curtis, professor of surgical research at Ohio State University, explained the urgent need of iodine as a trace element in soils. Major Z. T. Wirtschafter, M. C., U. S. Army, author of "Minerals and Man," discussed the role of certain minerals in human nutrition—sodium, potassium, calcium, magnesium, chlorine, phosphorus and sulfur. J. L. Lush, pasture specialist of the National Fertilizer Association, delved into the relationships of minerals and other nutrients to the feed and food values of plants.

"The most vital work being done in the state today is conservation education in the schools," stated Ohio's Governor John W. Bricker. "The health of this country is entirely dependent on the soil."

Friends of the Land had a worthy representation. So, too, did the Garden Clubs of America. On the program appeared John D. Detwiler, president of the Canadian Conservation Association, and Jonathan Forman, editor of the Ohio Medical Journal.

Tar Hollow for two busy, exciting days was a crossroads of conservation thinking, a sharp focal point of conservation viewpoints. The future of the soil and of the human race was the fierce concern of all.

And yet, for all the quickened tempo of the Conference, these two days were but a part—a better publicized part—of the six weeks' course of study. The distinguished visitors constituted a "guest faculty" furthering the larger educational purpose. The "plot" investigations went right along before and after the Conference.

The "plot" program at Tar Hollow is illustrative of the teaching methods. Each plot is of two acres; a long, narrow strip hugging a hillside and including both woods and clearings. Two students are assigned to each plot. Their task is an intensive one of research and observation, of measurement and correlation. It poses half a hundred other tasks, the purpose of which is to afford a complete, detailed understanding of the geology and soils of that small segment of the earth's surface, of plant and animal life. Soil profiles are examined and sketched from top to bottom of the slope—leaf litter and humus, depth and texture and colors of topsoil and subsoil and parent soil. Samples are taken of stream and run-off waters preceding and following a rain. Channels of air and water drainage are charted. Mineral resources are noted. Past and present land uses are considered. Plants are iden fied and cataloged and made friends with. A ce sus is made of bird and mammal populatio Insectivorous life is examined. Miniature natu trails are set up as for a particular school ba home. Reports are made detailing similar p projects to be arranged for other classes of stude in other locales. A complete ecolcgical picture drawn—the relationships of life to life, of natu processes to the welfare of man. The whole bio is the challenge. The science branches are bundl up together into the larger and more meaningf science and art of ecology, which controls the co patibility of Man and Nature in companionship a partnership.

All this is a forward step in education. It is humanizing step. It is a vital and urgent step the schools of the land are to help insure the futu of the land. Tar Hollow has taken this ste School men are watching. Some are speculati still others downright enthusiastic. Tar Hollow venture constitutes a departure, and departu must be scrutinized closely. That is probably fo tunate, because the necessity of close scrutiny h attracted to Tar Hollow a wide scattering of tea ers not only from Ohio but from other states, fr as far away indeed as the pavements of New Yo City and of Atlanta. They come, they learn, they a convinced. And they go back home to teach t little towheads—city and country lads, alike—n merely the wonders of the rock or the plant cell the amoeba, but the wonders and the significance the earth, of the life it supports, and of the hazar it confronts.

GIRLS IN GARDENS

The farm labor shortage is no great problem Harold L. Hindle, vegetable grower, who owns a operates Gate Hill Gardens, South Hadley, Mass

Mr. and Mrs. Hindle have four daughters, all whom work on the farm and during peak seas girl students at nearby Holyoke College are hi as supplementary help.

Mr. Hindle, incidentally, is an outstanding s conservationist and recently was given an aw by the Massachusetts Department of Agriculture his notable accomplishments.

At Gate Hill Gardens Mr. Hindle has construc 610 feet of diversion terrace and 660 feet of perm nent outlet. He has two acres in contour str and three acres in contour tillage.

BETTER IRRIGATION—KEY TO BETTER CROPS

(Continued from page 88)

; and rock emergency structure built on the Hondo River New Mexico to replace a diversion dam completely de- oyed by a record flood. Several hundred acres were kept in production by this work.

t is not possible, drop structures must be pro- ed. The farm planner has an extremely compli- ed and highly technical problem facing him en he starts working on an irrigated farm.

rrigation problems frequently afford engineers opportunity to exercise their ingenuity. At ishington Fields, Utah, investigations made in nection with a proposed drainage project revealed t heavy ditch losses occurred in main canals and erals. A few measuring flumes were installed, l the information which was obtained proved to of such value that the irrigation company is in- lling flumes on every lateral. At the same time, directors of the irrigation company are strongly ing each farmer to make more efficient use of ter in the hope that this will, to a large extent, eviate the drainage problem.

The Bergen Ditch Company, near Denver, Colo., s permitted by the State engineer to fill its No. eservoir only to half capacity because of the un-

crete turnout boxes which are sold to the farmers at by a New Mexico soil conservation district. To irrigate iently, such structural control is necessary at each outlet from the ditch.

Erosion is prevented in this ditch by means of low masonry drop structures. Note the wooden turnout boxes used to control the water being delivered to the field border.

safe condition of the earth dam. By means of a system of drains and the careful placement of additional earth on the dam, the structure was repaired. The reservoir could then be filled to capacity, and the acreage of irrigated land was doubled. The water from Red Creek, near Paragonah, Utah, was divided between two companies and the resultant unequal distribution and inefficient use wasted so much of the supply that only 1,450 acres of land could be irrigated in a haphazard manner. Soil Conservation Service technicians, overcoming problems of organization, water rights, and relative values, succeeded in effecting a consolidation of the two companies. With the construction of an additional storage reservoir and more efficient use, the community can put 2,500 acres of land under good irrigation.

The farmers on the Black-McClesky canal near Duncan, Ariz., must rely to a large extent on flood

flows in the Gila River for their summer irrigation water. The capacity of this main canal was so limited that none of the farmers could get their entire farms irrigated during these high water stages. Enlargement of portions of the ditch, changes in grade, and enlargement of structures have doubled the capacity of the ditch and eliminated crop damage caused by recurring water shortages.

Farmer interest in irrigation improvements is ahead of Service ability to furnish the technical guidance requested. There is a large and important field of work open to the Soil Conservation Service. A sample irrigation survey indicates that 75 percent of the irrigated land is in need of improved irrigation systems or improved irrigation practices. This constitutes an obligation and a challenge which should be embraced by the Soil Conservation Service. In accepting this opportunity the Service not only will further the war effort but also help to insure the permanence of agriculture.

DASH OF RAIN ADDS INTEREST TO COLUMN

Lyle B. Leonard, work unit conservationist at Clinton, Ky., not only writes a weekly column on soil conservation activities for the Hickman County Gazette, but also furnishes the paper with rainfall and temperature data for good measure.

Before the Hickman County soil conservation district was established, the hydrological section of the Soil Conservation Service set up a rain gauge and thermometer at the Kentucky Utilities plant. The recording instruments were later transferred to the Weather Bureau and, when an observer-without-pay was needed, Leonard volunteered to take the job.

In spite of wartime shortages of labor, farmers last year found time to plant shrubs useful for erosion control and wildlife, a million and a half of which will in two or three years product fruits suitable for preserves, jams, jellies and sauces. Among them wild plums of three species and cherries played a prominent role. Especially favored was the large western sand cherry, a good soil stabilizer in sandblow areas and a producer of a large, well-flavored fruit. Hazelnuts and filberts, blackberries and raspberries, currants, highbush cranberries, elderberries and grapes were among the other fruit-producing species much used on sites where they contributed to the holding of soil and to the prevention of excessive run-off.

REVIEWS

ARTIFICIAL MANURES. By Dr. Arthur Beaumont. New York City, 1943.

Dr. Arthur B. Beaumont's little book on "Artif Manures" is a very valuable document for the city gard or for the city man who moves to the farm—in fact anyone trying to produce crops without any backgroun the fundamentals of crop production.

Dr. Beaumont, in a few pages, presents a streaml picture concerning soils, their origin, and something of t productivity, and gives a clear view of a complex situa He discusses organic matter, humus, and the mysterie the carbon-nitrogen ratio in language that anyone can u stand.

One of the highlights of the book is the discussio "Fads, Fakes, and New Methods" that are constantly ping out in agriculture and particularly so at this time so many people working with the soil are perfect ta for the operation of fakers. Dr. Beaumont gives a example the case of ground acidic rock which a few y ago was sold in the Northeast as a plant food under diff trade names, and although the plant food in the mat was worth only a few cents a ton, uninformed buyers bo it in small lots, paying at the rate of more than $100 a He points out how to avoid such pitfalls.

The discussion concerning manures is excellent. The of mineral fertilizers and organic materials is set out cle it is shown that either will increase production mate but when both are used, production nearly doubles. Th course, is true where mineral deficiencies actually exi the soil.

Details are given for the building of a compost pile is so valuable to the city gardener. The use of cover is discussed thoroughly, even to the inclusion of a tabl ing seeding rates and dates. The place of soil conserv in maintaining and increasing production is also attention.

One section of the book pertains to the use of art manures for extensive farms. There is also informati value to greenhouse operators and mushroom growers addition, a very excellent list of selected references cluded for those who are interested in further investig particular phases of crop production, and the appendix the content of plant food elements in an extensive ci of materials that can be used for the preparation of cial manures.

This compact little book is an extremely worthwhil for the home gardener.

—C. R. Enl

The past year saw an increase of 44 percent in the nu of farm ponds managed for fish production by farm soil conservation districts. More than 3,000 ponds hav been carefully stocked with appropriate numbers and s of fish and are being fertilized to increase yields of fi food in various parts of the country. As a result of cooperation between the Soil Conservation Service a Fish and Wildlife Service, the latter bureau last yea vided a million and a half young fish for 1,350 ponds.

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Compiled by ETTA G. ROGERS, Publications Unit

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Cabbages on the contour! Cadets at the Navy Pre-Flight School, Athens, Ga., toughened themselves by working in thei 42-acre Victory garden.

NAVY PRE-FLIGHT SCHOOL GARDENS ON CONTOUR

The Navy Pre-Flight school at Athens, Ga., this year "killed two birds with one stone" in its 42-acre victory garden. By working in the garden, cadets conditioned themselves for flight training and eventual combat duty, and produced enough vegetables to supply the mess halls for about 4 months. Two thousand men are fed daily in the mess halls.

Cadets who come from all parts of the United States are learning about conservation farming, as the entire garden is terraced and practically all vegetable crops are grown on the contour. This is done to hold soil washing during heavy rains to a minimum, and to conserve moisture and plant food.

The garden produce formed a substantial par of each cadet's daily 5,000 calorie diet. One hun dred thousand onions were planted, half an acre o turnips, a quarter-acre of carrots and greens 10,000 tomato plants, 6 acres of corn, 3 acres of strin beans, and 3 acres black-eye peas. As the earl produce was harvested, squash, okra, radishes, yams beets, watermelon, and cantaloupe were planted.

Navy officials estimate that the cadets harveste some 80,000 ears of corn, 80,000 tomatoes, and 7,00 heads of cabbage. These, along with other vege tables coming from the contoured victory garden supplied needed vitamins and balanced meals and a the same time eased the burden on the food suppl in Athens and vicinity.

U. S. GOVERNMENT PRINTING OFFICE: 1943

November 1943

SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

ED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

Contents

Front Cover
George N. Barbee, Brown Creek Soil Conservation District, N. C., with some of his flock of 200 turkeys

Photographer: O. S. Welch

WELLINGTON BRINK
EDITOR

SOIL CONSERVATION is issued monthly by SOIL CONSERVATION SERVICE of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. SOIL CONSERVATION seeks to supply to workers of the Department of Agriculture engaged in soil conservation activities, information of special help to them in the performance of their duties. Copies may also be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., 10 cents a copy, or by subscription at the rate of $1.00 per year, domestic; $1.50 per year, foreign. Postage stamps will not be accepted in payment.

SOIL CONSERVATION

CLAUDE R. WICKARD
SECRETARY OF AGRICULTURE

HUGH H. BENNETT
CHIEF, SOIL CONSERVATION SERVICE

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SOUTH CAROLINA NOW JOINS ALABAMA

By ERNEST CARNES

EVERY COUNTY in South Carolina is now in one of the State's 21 farmer-operated soil conservation districts.

The last, culminating step was taken recently when Secretary of State W. P. Blackwell issued a revised certificate of organization for the Jasper Soil Conservation District, previously organized, to include adjoining Beaufort County.

South Carolina is the second State in the Nation completely blanketed with districts—more than 19 million acres being included. Alabama was the first.

Shortly after the passage of the State Soil Conservation Districts law in 1937, farmers in South Carolina got very, very busy. First to complete organization were the Edisto and Upper Savannah Districts. Interest initially centered in the Piedmont and Upper Coastal Plain sections, but later farmers in the Lower Coastal Plain began organizing districts. Although the land in the Lower Coastal Plain is comparatively level, farmers there realized the need of making better use of the land in accordance with its capabilities. They were mightily concerned with drainage, pasture development, improved crop rotations, forestry, and such relatively new forage and hay crops as kudzu and sericea.

Particularly active in helping the districts advance their programs have been the State Soil Conservation Committee and the South Carolina Association of Soil Conservation District Supervisors. E. C. McArthur of Gaffney, a supervisor of the Broad River District, has been chairman of the supervisors association since its organization in 1940. Members of the

Soil conservation districts in South Carolina.

State Soil Conservation Committee are D. W. Watkins, Director, South Carolina Agricultural Extension Service; H. P. Cooper, Director, South Carolina Agricultural Experiment Station; and Ernest Carnes, State Conservationist, Soil Conservation Service.

As a result of the work by districts, complete conservation plans have been developed for 9,142 farms covering 1,623,335 acres. These plans provide for bringing many acres of idle or badly eroded land back into profitable production, and for the establishment of necessary soil conservation practices on other lands to protect them from erosion.

Changes in land use, as called for in the conservation plans for individual farms, generally resulted in less acreage for cotton and corn. But with improved crop rotations and the use of legumes, yields per acre have increased, resulting in a larger production of these crops on less acreage. This shift in land use and the use of idle land has enabled many district cooperators to put more land into pasture and hay and feed crops for livestock, bringing about a more diversified system of farming.

EDITOR'S NOTE.—The author is state conservationist, Soil Conservation Service, Columbia, S. C.

WAR COMES TO THE "BRIAR PATCH"

By L. J. LEFFELMAN

THE WAR HAS REACHED the "Briar Patch" country, made famous by Joel Chandler Harris at his birthplace near Eatonton, in Putnam County, Ga. During the past year the Plantation Piedmont land utilization project of the Soil Conservation Service, which includes Putnam County, has sold approximately 7,000,000 board-feet of lumber, veneer blocks, cross-ties, pulpwood, and other forest products to fill war production needs.

When Joel Chandler Harris wrote the story of "Uncle Remus" and the exploits of Br'er Rabbit, Br'er Fox, Br'er Possum, and other fabled occupants of this area, most of the trees now furnishing vital war materials were just beginning their life journey which was ultimately to end in flying glory as plywood bombers, crating for Garand rifles, shells, and tanks, or as building lumber for barracks and general camp construction.

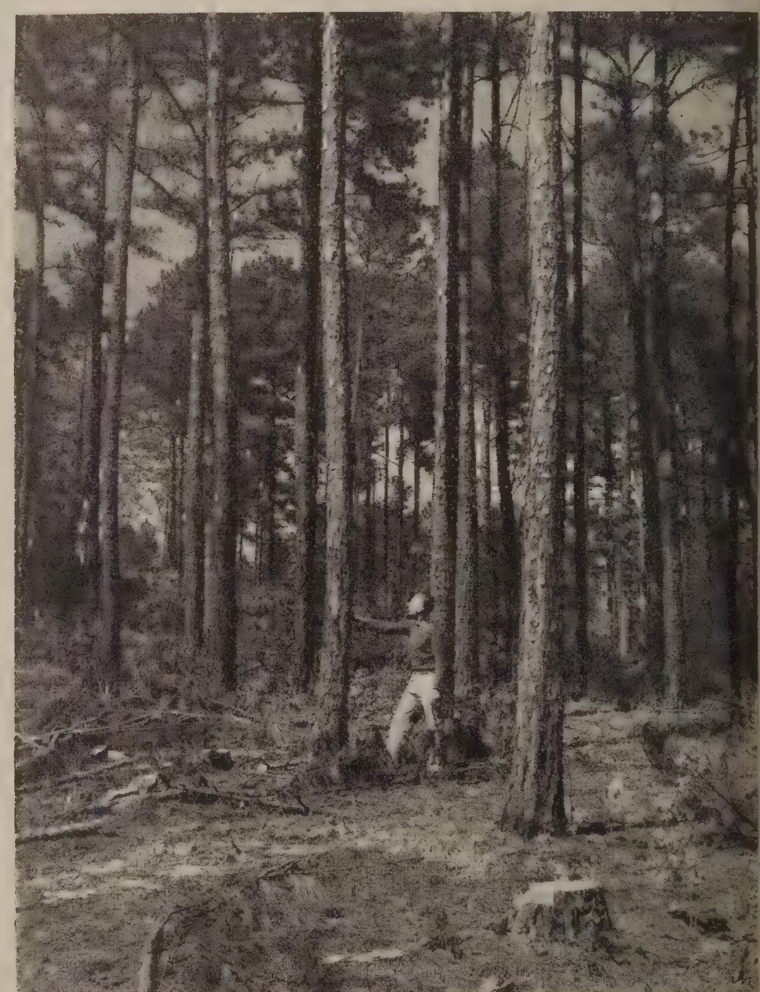
This particular part of Georgia originally was one of the finest examples of the "old plantation system," in which cotton was king. In time, as the result of uncontrolled erosion and later the coming of the boll weevil, it became an area of worn-out, gullied, and abandoned farms. Finally, when the depression dealt its devastating blow, the Government was asked to step in and lend a helping hand.

About that time, Congress enacted the Bankhead-Jones Farm Tenant Act. This act provided among other things for the purchase of submarginal land, relocation of the occupants of such land on better areas, retirement of purchased areas from intensive agricultural use and their development for extensive uses to which they were better adapted, such as forestry and grazing, and in some cases wildlife and recreation.

After several months' study of the local situation, the Plantation Piedmont land utilization project was officially approved in the fall of 1934 as the first project of its kind in the United States. W. F. Leverette, of Eatonton, was appointed project manager, and the work of buying and developing the 72,000 acres now included in the project began early in 1935. Immediate work was provided for several thousand people living in that section who had not seen a pay check since the beginning of the depression.

EDITOR'S NOTE.—The author is chief, regional land management division, Soil Conservation Service, Spartanburg, S. C.

Smaller logs from improvement cuttings on the projec[t] provide pulpwood for war uses.



Properly cut timber on Plantation Piedmont project—brus[h] lopped and scattered, stumps cut low, thrifty trees left fo[r] future harvesting.

Fire towers with telephone lines to headquarter[s] were constructed to spot forest fires quickly, an[d] many miles of roads and fire trails were built to ai[d] in fire suppression. Millions of trees, shrubs, an[d] other plants were set out for erosion control on aban[-]doned fields and in gullies, where ample food an[d] cover were provided by these plantings for Br'e[r] Rabbit and his neighbors of the "Briar Patch."

Rock Eagle Indian Mound was restored and Rock agle Lake, now classed as one of the best bream ıd bass-fishing lakes in the State, was constructed. he mound, a large pile of rocks shaped like an gle, 120 feet from wing tip to wing tip, 102 feet om head to tail, and 8 feet high in the center, said by archeologists to be one of the most impor- nt effigy mounds east of the Mississippi River.

During the project's development period, 450 farm milies who had been trying to make a living on orn-out lands were assisted in finding new homes ı better land, many with the aid of the Farm Se- ırity Administration. Old broomstraw fields on the pandoned farms were planted to kudzu and other ay crops or developed for pasture, and made avail- ble to farmers near the project to provide them with ıpplemental grazing and hay for their livestock nder an equitable fee permit system.

A survey of forest products showed that consid- able amounts of valuable timber still remained in ıe project area. Many of the old plantations had ature trees standing near old house sites, along eek bottoms, or in gullies where the land had first een abandoned as a result of erosion. Many old elds had reseeded to fairly good stands of loblolly ıd shortleaf pine and the past 8 years of intensive e protection has helped materially to increase rowth in these young stands and make them ready r early thinnings for pulpwood.

As a result of the survey, a program of timber and ulpwood sales was begun on a small scale to meet cal building needs and to provide seasonal part- me work for people living on or near the project. bout this time a tornado hit the project and did nsiderable damage to scattered stands of timber. contract awarded through bids to a large operator esulted in salvaging about 1,000,000 feet of this ind-thrown timber.

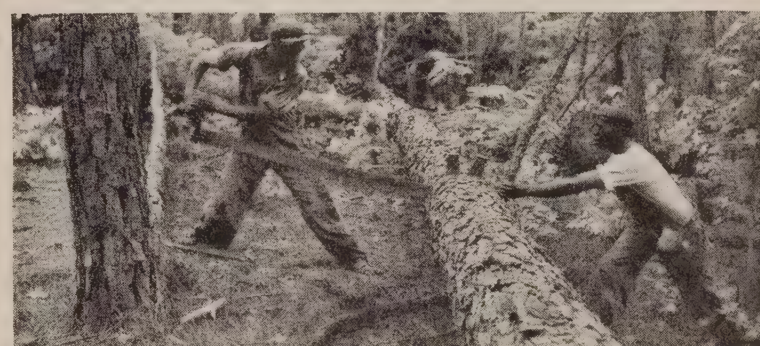
By the time this sale was completed, the war pro- ram was demanding forest products of all types ıd kinds, including pulp for plywood and plastics, ating for guns and planes, and lumber for packing ases of every description. In the project, forested reas represented all stages of growth, from seedlings ıst taking over old fields to small scattered stands f mature timber. Under these conditions, logging as especially adapted to small operators who could et up, complete logging and sawmilling, and move another site without too much expense.

The goal of forest management requires careful election of trees to be cut so as to promote the rapid rowth of remaining trees and to develop high qual- y timber. No clear cutting is permitted. All trees

(*Continued on page 116*)

Green lumber from Plantation Piedmont project piled for drying at planing mill near Monticello, Ga.

An example of improperly cut timber from which no further return can be expected during an average lifetime. Large and small taken indiscriminately, stumps left high.



Sawing pine tree into logs on Plantation Piedmont project.

Crating material needed in the war program will be provided by these veneer blocks loaded at Hillsboro, Ga.

CASCARA BARK GOES TO WAR

These are leaves of cascara buckthorn, sometimes confused with those of red alder.

By ALBERT ARNST

POSTERS designed for a specific purpose can stimulate war time conservation on a widespread basis. This fact was illustrated by Soil Conservation Service foresters in the Pacific Coast Region in encouraging the conservation harvesting of cascara bark during the 1943 peeling season.

Out in the Pacific northwest, where the Axis already has dropped fire bombs in forests and shelled beach points, the bark of cascara buckthorn (*Rhamus purshiana De Candolle*) has gone to war. It has joined the Allies as a medicinal drug to keep our forces in top physical condition. Cascara bark long has had commercial significance, because its extract is used widely as a laxative and cathartic. First aid kits of our armed forces include cascara pills because of their tonic influence.

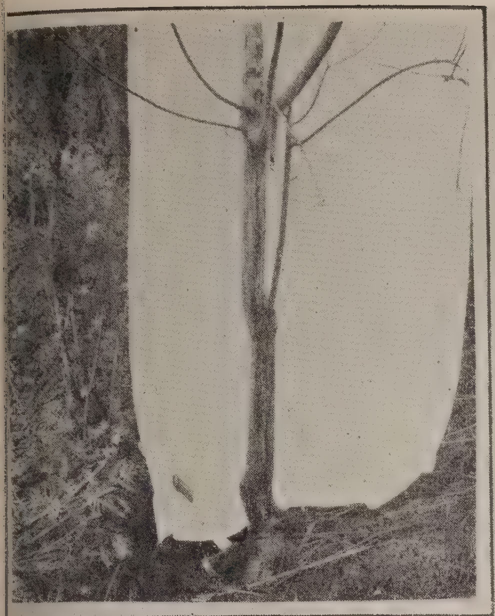
The "We Buy Cascara Bark" sign is an accepted symbol of rural life in this area. For many years, the annual bark harvest has been an important income source for farmers, part time loggers, school children, and even vacationists. In 1943, the combined demands of our armed forces and lend-lease commitments will swell the harvest to some 5,000,000 pounds of dried bark. The mid-year war industry price of 20 cents a pound, compared with the norma average of 5 cents, has brought many 'teen-agers an women to the woods for their first try at peelin cascara's yellow gold. And with them came a increased problem of destructive harvesting b inexperienced hands, of a likewise important soi conservation tree.

The tree's commercial range extends from souther British Columbia south to northern California chiefly west of the Cascade Mountains and in th coastal regions. Once common as a large tree, it no is found mostly in diameters up to 6 inches, except i the more inaccessible areas where larger specimen still can be found. Cascara is a frequent inhabitan of cut over lands and occurs along most rural fenc rows and road edges. It is of direct benefit to wild life, for birds relish its fleshy fruit.

Forest conservationists for many years have bee concerned with the perpetuation of cascara as a for est tree and as an industrial resource. Because a hig percentage of the bark is garnered through trespas a condition resulting from the small owner's indif ference to cascara's stumpage value, much peeling i unregulated and unsupervised, which leads to de structive practices in bark harvesting.

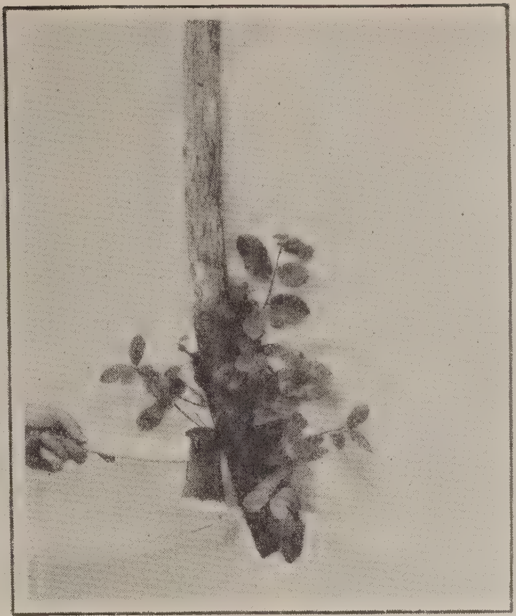
On the opposite page is a photographic reproduction of the job sheet, or poster, that was devised by Soil Conservation Service foresters to encourage conservation harvesting of cascara bark.

EDITOR'S NOTE.—The author is district forester, Soil Conservation Service, Sedro-Woolley, Wash.



BAD PRACTICE

This tree was peeled to the ground and left standing. Half the bark was wasted, and the tree was killed. Such unnecessary waste depletes the future supply of Cascara, vitally needed in war and peace.



NOT TOO GOOD

This tree was peeled and left standing. Probably half the bark was wasted but the peeler did leave an unpeeled stump. The tree will produce another crop, but the roots have been weakened by the top. The new sprouts are weak, and the leaves are not too healthy.

GOOD PRACTICE

This tree was cut down before peeling. No bark was wasted. The low-cut, unpeeled stump with a sloping top has several healthy new sprouts which will produce another crop quickly. Conservation pays, both now and when the next crop is ready.

These three trees were peeled in the spring of 1942 at about the same time; photos taken after one growing season.

••MANAGE YOUR CASCARA••

ALONG COUNTRY ROADS ONE SEES MANY CASCARA TREES THAT ARE PEELED ONLY AROUND THE BUTT. MOST OF THE BARK HAS BEEN WASTED. THE TREES ARE NOT CUT OFF AT STUMP LEVEL; AND THE BARK HAS BEEN PEELED DOWN TO THE ROOTS, WHICH KILLS THE TREES.

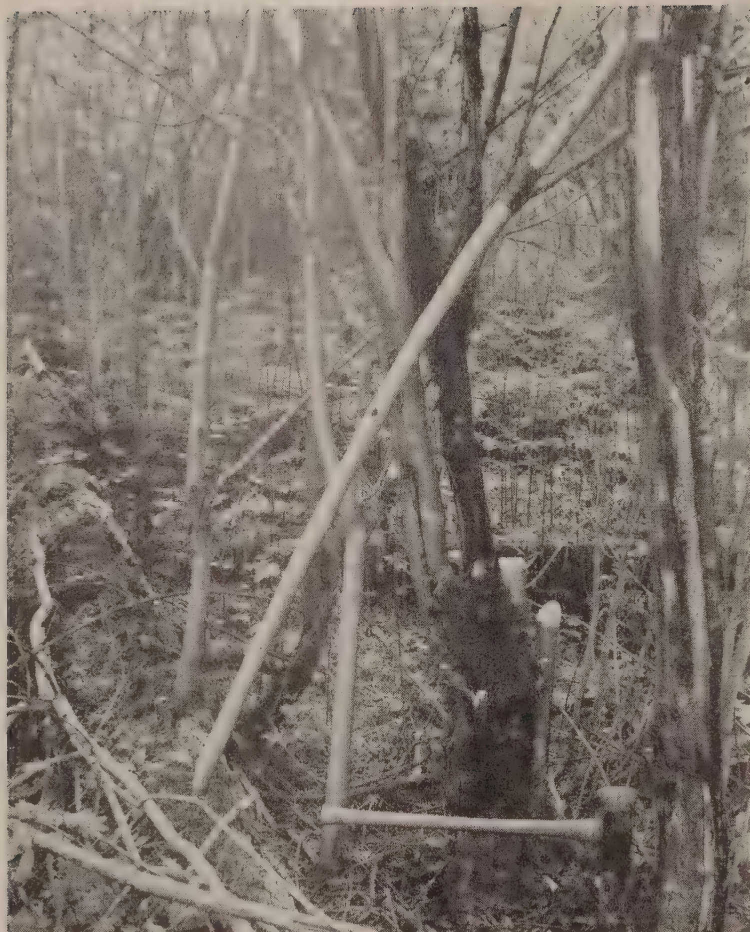
IN THE INTERESTS OF CONSERVATION, FORESTRY DEPARTMENTS OF OREGON AND WASHINGTON HAVE OUTLINED SUGGESTED RULES FOR THE PEELING OF CASCARA TREES.

- TREES SHOULD BE FELLED BEFORE PEELING BECAUSE NEW SPROUTS WILL SPRING FROM THE STUMP AND PROVIDE A NEW CROP IN ABOUT TEN YEARS.
- TREES LESS THAN FIVE OR SIX INCHES IN DIAMETER SHOULD NOT BE FELLED. PEELING SMALL TREES IS A WASTE OF TIME AND MONEY; BECAUSE SMALL TREES WILL NOT YIELD ENOUGH BARK TO MAKE PEELING PROFITABLE, AND MANY YEARS OF GROWTH ARE LOST.
- LEAVE AN UNPEELED STUMP NOT OVER SIX INCHES HIGH WITH A SLOPING TOP TO SHED RAIN. AS THE ABOVE PICTURE SHOWS, THIS PRACTICE IS ESSENTIAL IF THE TREE IS TO LIVE AND PRODUCE FUTURE CROPS OF BARK.
- LIMBS AND BRANCHES SHOULD BE PEELED DOWN TO A DIAMETER OF ONE INCH. THE NATION NEEDS CASCARA BARK AND IT SHOULD NOT BE LEFT TO ROT ON LIMBS.
- PEELERS SHOULD TAKE EVERY PRECAUTION AGAINST STARTING OR SPREADING FIRES.

THE ENTIRE WORLD'S SUPPLY OF CASCARA COMES FROM THE NORTHWEST. WITH PROPER CONSERVATION, IT WILL REPRODUCE ITSELF SUFFICIENTLY FAST ON A LOGGED-OFF LAND TO INSURE A CONTINUOUS CROP, PROVIDED THERE IS REASONABLE CONSERVATION PRACTICE AMONG PEELERS.

CASCARA BARK IS SHIPPED TO THE DRUG TRADE, AND THE LAWS GOVERNING THE HANDLING OF CRUDE DRUGS ARE VERY STRICT. THE LAW REQUIRES THAT ALL BARK BE FREE OF ADULTERATIONS, THOROUGHLY DRY, AND REASONABLY FREE OF MOSS WHEN OFFERED FOR SALE. THE BEST WAY TO DRY BARK IS IN THE SUN, BUT BARK MUST NOT BE ALLOWED TO REMAIN OUT DURING PROLONGED RAINS; BECAUSE RAIN LEACHES OUT THE VITAL EXTRACTS.

For further information inquire U. S. DEPARTMENT OF AGRICULTURE • SOIL CONSERVATION SERVICE



A mixture of good and bad practices. Not all the limbs have been peeled clean. The entire tree, furthermore, should have been cut down to promote vigorous sprouting.

Chief among the harvesting abuses is the prevalent practice of *not* cutting down the tree after the bark has been peeled. Cascara is a prolific stump sprouter, and growing coppice stands is the cheapest and easiest way of maintaining a perpetual bark supply. Consequently, it is essential that every peeled tree be left in best condition for vigorous sprout production. A peeled tree (left standing) will die and will produce no sprouts, or very weak ones at best.

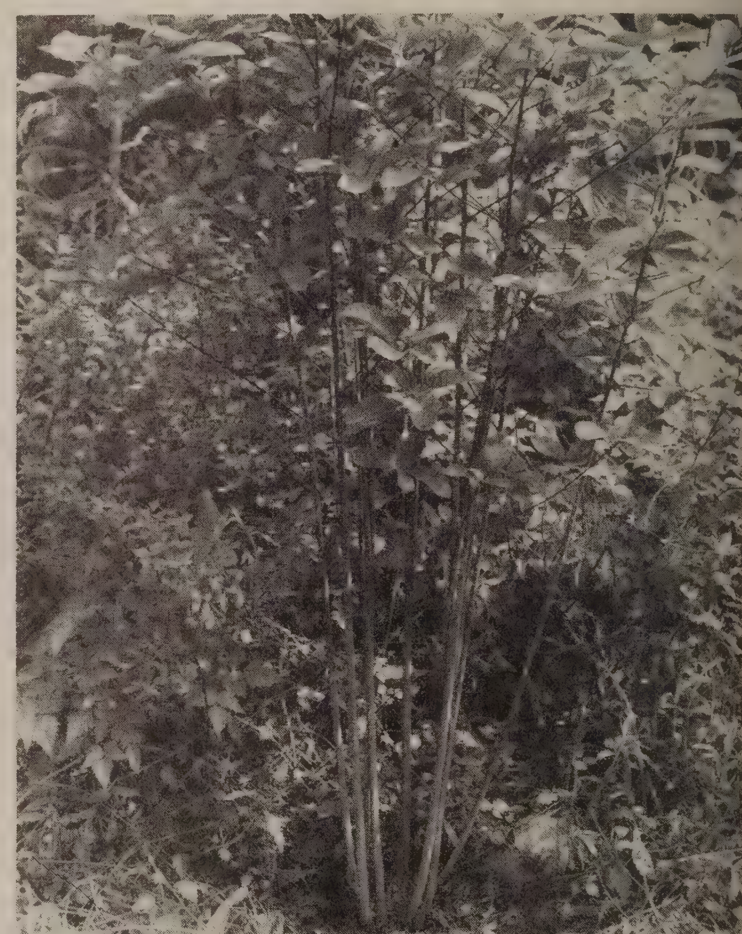
The surest guarantee of sprout regeneration is the leaving of a low, unpeeled stump with sloping top to shed rain. Other management practices are important, such as peeling larger trees and small limbs, thinning sprout growth and making cultural prunings. But if every peeler strictly observed the one rule of cutting down the tree after peeling, a future supply of cascara bark would be assured.

Some education in conservation harvesting of cascara bark has been carried on by the "big three" crude drug dealers in the northwest. A number of timber companies and the United States Forest Service have used conservation contracts in selling cascara stumpage. Printed pamphlets and placards have been circulated to the schools, and other educational means have been employed.

Because of the certain emphasis that would be given bark peeling in 1943, and because of the new peelers pinch-hitting for veterans now in the armed forc or war work, it early seemed particularly appropria that conservation be emphasized in this year's ba harvest.

Soil Conservation Service foresters appreciated t need for conservation harvesting of cascara bark Western Washington, and realized the contributi that the local soil conservation districts could mal An illustrated poster offered distinct possibiliti One developed for public display seemed more a vantageous than a page-size reproduction for ind vidual distribution, because it could be placed reach more peelers.

A sheet of instructions was drawn up and r quisitioned for the expected local demands fro schools, stores, bark dealers, and others. The 11-b 14-inch poster was distributed in May to the schoo in Skagit and Snohomish Counties, for bulletin boa



Cascara's sprouting tendency facilitates its reestablishme From 4 to 15 sprouts may develop from 1 stump sectio if the tree is cut down.

use, and sent to other public display points, such banks. Copies were provided crude-drug deale whose branch offices were near the territory to covered.

The response from these professional dealers w gratifying beyond expectations. Instead of the cu tomary "we acknowledge receipt" letters, orders we received for large quantities of the poster, to placed in almost every town and village in Weste

School children find bark harvesting a profitable occupation.

(regon and Washington and Northern California. ˈhe widespread organizations of the "big three" c̦ude-drug dealers, extending into virtually every c̦mmunity, gave the poster a vast audience that c̦uld not have been obtained from in-Service dis-tibution.

The State Supervisor of Forestry in Washington c̦dered a supply for distribution to district fire ardens, who, in issuing forest-use permits, called tention to the conservation rules. One large tim-r company used the posters in its numerous log-ng camps. Other miscellaneous requests were re-ived from dealers in evergreens and from inter-ted professional foresters.

By August the total distribution had reached bout 1,300 posters. Of this amount almost 1,000 ere sent out in reply to requests from private urces, such as the crude-drug dealers.

Although it is difficult to measure the precise effect the poster in obtaining better conservation in bark arvesting, it is possible to approximate the audience ached. Most crude-drug dealers placed the poster ear the weighing scales at bark-collection agencies, nd the sheet therefore was observed by many people nd by the proper class of people, namely, the peelers. conservative estimate is that each poster was seen nd read by at least 100 people, which would com-rise an audience of 130,000 individuals, most of em peelers or associated with the peeling trade.

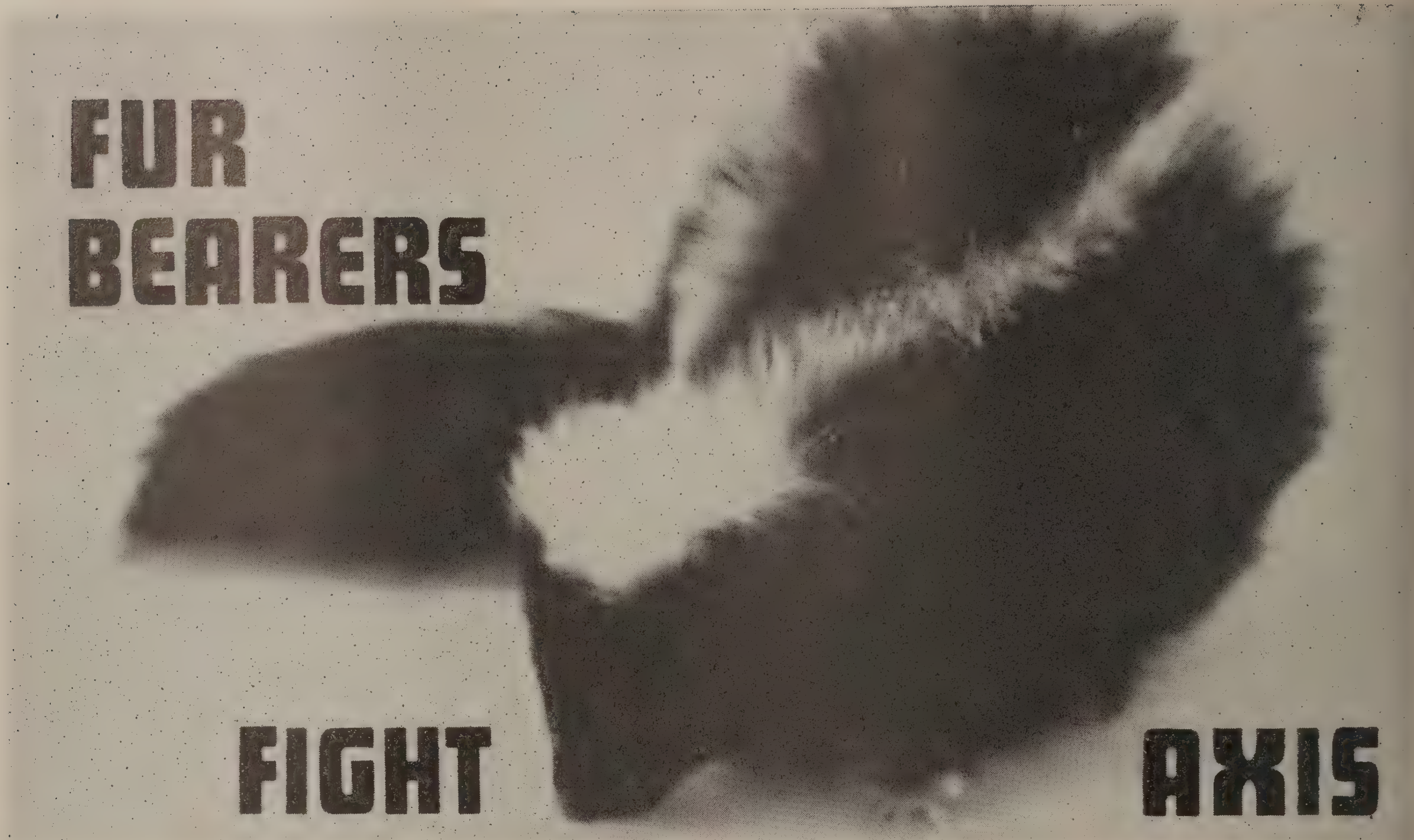
Official travelers in Western Oregon and Washing-on have reported the popular interest created such comments as "The pictures showed me for the first time why it is so important to cut down the tree." The sheet prompted individuals to write cascara conservation letters to newspapers, and in this correspondence the phraseology of instructions frequently is obvious. Unquestionably, this widespread popular interest has resulted in widespread conservation on many acres of cascara land.

Soil-conservation districts up and down the coast featured local articles in newspapers and farm journals, stressing also other important phases of cascara management. Managing sprout growth by thinning the numerous stems to three or four of the most vigorous ones and retaining them for crop maturity was discussed, as were variations in bark-harvesting methods. Information was included as to spacing, livestock protection, sources of tree stock, cultural treatment, and harvest yields of dry bark.

Farmers also were given planting instructions for setting out cascara plantations, and complete farm plans developed with cascara owners contained the detailed good management practice recommendations.

The success obtained with this illustrated poster outlining fundamental conservation practices may suggest possibilities in other regions where a farm or forest crop lends itself to similar widespread treatment. By selecting only one or two of the more important practices for dramatized presentation by visual methods, much wartime conservation can be effected on vital production battlefronts at home.

FUR BEARERS FIGHT AXIS



Two and a half million skunks are taken annually in the United States. With 9,000,000 muskrats, 3,500,000 opossums, 600,000 raccoons and 450,000 mink, the farm fur bearers go to war—producing fur, fat, and food.

By PHILIP F. ALLAN

THE FUR-BEARING ANIMALS have been called to the fight against the Axis. On the basis of their contribution they might well receive a Selective Service classification—3F—fur, fat, and food. The draftees are a group of wild animals drawn from the farm lands of the United States. Into the battle march platoons of mink, regiments of 'coons, divisions of skunks, and armies of 'possums and muskrats.

The pelts of these small residents of farm and ranch provide warm linings for gloves, hoods, vests, and other apparel for the armed forces and for civilians working in arctic climates or high altitudes. The merchant marines of the United Nations are clothed in fur vests in winter. Mountain infantrymen of many nations are well-equipped for cold-weather fighting with parkas, breeches, and gloves lined with furs. Meanwhile, Hitler begs each year for fur coats to enable the Wehrmacht to face the Russian winter.

It is from the furs that the most important co tribution of the muskrat, opossum, skunk, raccoo and mink comes. The 16,000,000 annually take provide an important, if minor, source of farm i come. They are produced principally on parts o the farm or ranch unsuited to the production of cu tivated crops, livestock, or timber. Marshes, pond stream banks, drainage ditches, hedges, woodlan borders, gullies, and rocky outcrops are the homes o fur bearers. These areas are common on nearly ever farm and total more than 30,000,000 acres on agri cultural land. With little or no management what ever the five farm fur bearers are produced—in Iow to the extent of $820,000 worth annually, in Minne sota between one and two million dollars worth, i Pennsylvania $800,000, in Texas $750,000, in Nort Dakota $333,000, and in California $125,000.

The fat from skunks, opossums, raccoons, and sev eral other animals are being added to the salvage o other fats for the production of glycerine—a step i the manufacture of nitroglycerine and other ex plosives. In Missouri, the St. Louis Fur Institut and private individuals saved more than 260,00 pounds of such fats, while in Pennsylvania 94 ton were saved. Converted into ammunition this amoun of fat means 750,000 rounds of 37 mm. antiaircraf shells and 1,880,000 rounds of .50 caliber machine-gu cartridges. Since the combined harvest of these tw States is about 9 percent of the total number of fu bearers taken annually, if fats were saved at the sam

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EDITOR'S NOTE.—The author is assistant chief, biology division, Soil Conservation Service, Washington, D. C.

A stream which cuts into crop fields is a distinct liability, and the trapper would waste his time here.

'he willows and cattails planted 18 months earlier have already provided a place where the trapper could expect to catch a skunk or muskrat. Furthermore, the crop field is protected.

'ate elsewhere, some 2,500 tons were contributed by 'ur bearers—enough to provide explosives for a oombing raid "in great strength."

Fur bearers are useful as food. Maryland musk-'ats have long been sold in Baltimore, Philadelphia, ınd Washington markets. Louisiana officials claim he annual production of these so-called "marsh 'abbits" in their State would equal 6,000 beeves. In some localities in Texas 40 percent of the opossums caught are used for food, while Ohio Conservation Department officials estimate that 88 percent of the raccoons taken in that State are eaten. Several other animals whose fur may be sold, likewise are useful food animals, notably, jack rabbits, cottontails, squirrels, and woodchucks.

Farmers and ranchers are helping the fur bearers to fight the Axis by providing homes for more of them. Land operators are more familiar with

Small areas unsuited for production of cultivated crops, pasturage, or timber, abound on the Nation's farms and ranche These odd spots produce many of the farm fur bearers.

managing land than with managing wild animals, but they know simple land management measures that bring about material increases in fur-bearer fighting forces. Anyone who has trapped muskrats, 'coons or mink knows that more of them will be found along a well-vegetated streambank than along one which is raw and eroding. There are two simple ways in which to develop the vegetation that will not only prevent further erosion but also provide homes for those fur animals. Protection of the banks by fencing or converting suitable adjacent fields from pasture to cultivation permits a natural growth of streamside plants to become established. When, as streams frequently do, they cut into valuable adjoining lands the prevention of further cutting is justification in itself for developing vegetation. The accompanying fur bearers are an added value. Not all streambank protection is as simply accomplished. Usually it must be accompanied by erosion control measures on the watershed to prevent rapid run-off of water. Sometimes structures are needed to prevent streambank cutting and suitable species of plants, such as willows, must be established by planting. Comparative studies show that there are two to four times as many muskrats per mile when the stream bank is protected as when the stream bank is grazed.

Farm drainage ditch banks and the shores of pon and lakes produce many more fur bearers when go habitats are provided through the establishment suitable vegetation as when the banks are bare. E posure to livestock and continued burning usuall destroys the kinds of plants best suited to fur bea ers and often assures a crop of obnoxious weed Reports indicate that yields of muskrats along ditch designed to improve crop fields and pastures by drai age are much greater when the banks are well veg tated, while marshy lake shores may yield 100 perce more muskrats than bare "resort type" shores.

Fencing, planting and other measures for t establishment of erosion-control vegetation in stri mined areas, gullies, box canyons and rocky outcro are equally effective in improving such areas for f bearers. In the woodland, protection from fire an the grazing of livestock, selective cutting of timbe the preservation of den trees and the establishme of shrub borders all contribute to creating or pe petuating homes for fur bearers. Contour hedg and borders of shrubs in croplands and pastures a erosion-control measures favorable to the productio of such fur bearers as the skunk.

Where practical, more complex treatments of t

(*Continued on page 117*)

CAJA de MUERTO

BY THOMAS A. HESTER

Caja de Muerto Island, which can be seen from Senor Matos' home.

HE VIEW from Senor Antonio Matos' home, sitted on one of the highest ridges overlooking the ribbean Sea, is as fine as any in all the green land of Puerto Rico. The house was built to ake the most of the view and from his front porch, hen the weather is clear, Senor Matos can see across broad expanse of blue water the box-shaped island own as the Caja de Muerto, which in Spanish eans Death Box, or coffin.

It was pleasant for Senor Matos to live there with s family, surrounded by 60 acres of his own land. it although the Matos family worked hard in the lds, they did not prosper. Finally, there came on the 60-acre farm an $800 mortgage and Senor atos, his good wife, and their five children were longer happy. The Caja de Muerto loomed cross e blue water like an evil omen.

"Then," says Senor Matos, "the view depressed e. What could I see? The Death Box in the stance and close at hand a farm burdened with a ortgage, here and there a few half-hearted patches food crops parched by the long rainless season, e rest of the land bare and useless, and a lonesome th leading to the highway a half-mile away.

"For a truth," the Senor declared, "I thought I ould move away, for the outlook was none too good. it now, ah! . . ." the Senor paused and waved hand to indicate this cheerful view of the present d future.

Just when despair was darkest, Senor Matos held consultation with himself. To be sure, the crops d failed; certainly, the farm was mortgaged. But e worst thing that had happened was that he had cepted failure as inevitable and, because of this, s whole outlook had changed. Then it was that new determination came to the rescue. *I must ve a long-range plan that will enable me to improve my farm and pay off my mortgage*, Senor atos decided.

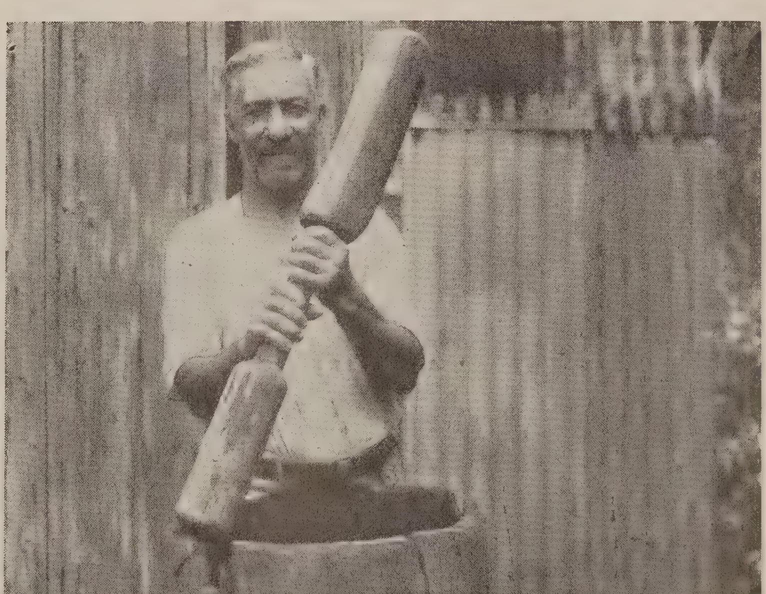
The more he thought of it, the more he became nvinced of the wisdom of a long-range farming in. So Senor Matos enlisted the best technical aid he could find. The Soil Conservation Service made a survey of his farm to determine the type of soil, the best farming practices, and the crops best adapted to his land. The wet seasons, followed by long dry periods, posed special problems.

"Of course," Senor Matos relates, "I could not do everything to change my farm, but I could begin if I had a plan to tell me what to do first. I could not wave a wand, or even a machete, and improve everything at once, but I could start."

Several yards below the house on the mountainside, there was a clear bubbling spring, pouring out of a big pipe stuck in the mountain. Fresh, cool water in abundance came out in a stream as big as a man's arm. Why not use the water to wet the parched hillside lands? Never to begin is never to win, Senor Matos decided, so he set to work. With expert engineering supervision, he built an irrigation system so that he could water his land when the dry season comes.

All of Senor Matos' farm is very steep and the oxen must pick their way carefully over the mountainside, lest they stumble and roll to the foot of the mountain far below. During the rainy season much water falls continuously on the steep land and, were it not for the rock and vegetative barrier which

Senor Matos with maul used for husking coffee and rice in wooden "pilon" in much the same way as American Indians made corn meal.



ditor's Note.—The author is Associate Soil Conservationist, Soil servation Service, Meadsville, Miss., formerly stationed at Ponce, rto Rico.

Senor Matos has constructed across the slopes and rows planned on the contour under the supervision of Service technicians, the soil, too, would slide down the mountain side. Senor Matos has learned also the value of keeping something growing on the land at all times.

And now, with his irrigation system to water the land during dry periods, his rock and vegetative barriers and contour farming methods to hold the soil in place, and a sound farming program which provides a sequence of crops and keeps the land covered throughout the year, Senor Matos has a continuous supply of vegetables for his family and a surplus for sale. A pasture improvement program developed as a part of the farm plan has enabled him to increase his cattle from 13 to 17 head, and to keep the cows better fed. The milk production on the farm has doubled. The entire mortgage, with the exception of $55, has been paid since his farm plan was developed.

The five-year conservation plan for the farm includes many improvements which Senor Matos has not yet made. Among these is a project for installing a hydraulic ram to pump water from the mountain spring up to the house. Then there will always be plenty of running water to wash the dishes, the clothes, the family, or the floor without the back-breaking job of bringing water in pails up the steep hillside. Mrs. Matos and the children are looking forward to this.

"I will be glad when running water means I won't have to run and get it," comments one of the little Matos children.

The path from the highway is beaten smooth no by the people who come up the mountainside to bu food fresh from the farm. No one is hungry o the Matos farm, except those who come to buy foo and they do not go away empty handed.

"It is nice to make such friends," says Señ Matos, "and it is pleasant to hear the jingle of coi from the sale of the vegetables."

When Señor Matos sits on his porch in the co of the evening, after a profitable day's work in tl field, he doesn't find the view depressing any mor

"You know," the Señor remarked, as he sat o afternoon with some guests eating fresh home-grow fruits from a large platter, "That Caja de Muer doesn't look like a Death Box to me any mor Don't you think it might be a treasure chest, i stead?"

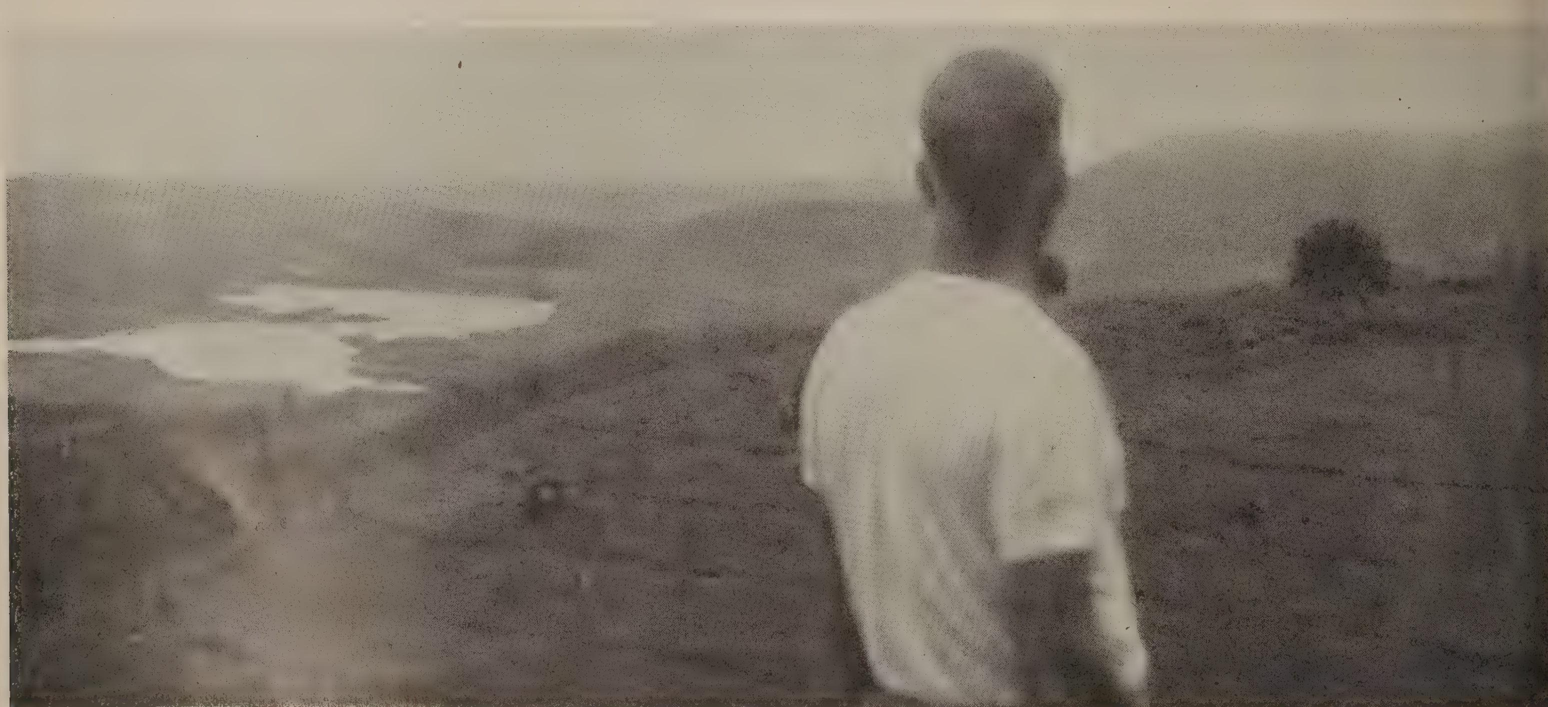
BEAT THIS, IF YOU CAN

A phenomenally long row of corn is to be found Roy Eiffert's farm 3 miles southeast of Monon Iowa. It is 14.6 miles long! This row of corn planted on the contour, and winds around a h corkscrew fashion.

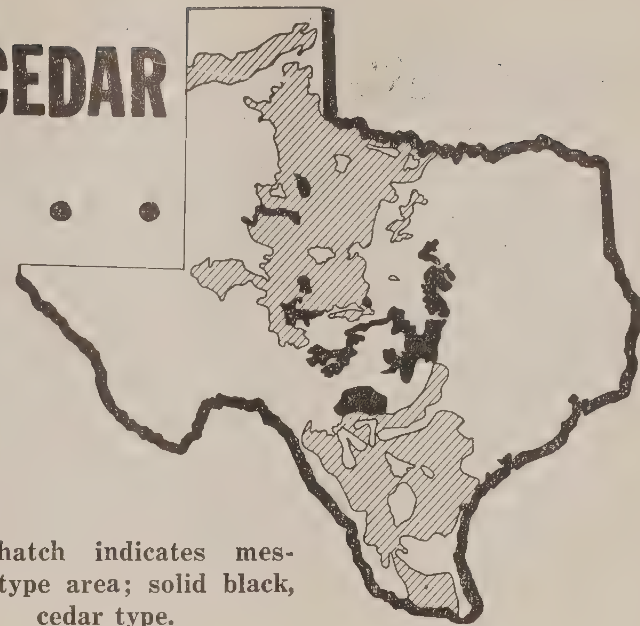
Mr. Eiffert has contour-planted his corn for t past 8 years and believes it to be a very good farmi practice. He states, "I have lost very little, if a soil from the contour corn fields this year."

Mr. Eiffert also carries on other conservation pr tices. He is one of the first farmers in Clayton Coun to use lime. All fields on the Eiffert farm have be limed two times and some have been limed a thi time.

Senor Antonio Matos looking across contoured hillside of farm toward Guayabal Lake, 2 miles away and 4,000 feet lower in elevation.



IGHTING THE MESQUITE AND CEDAR INVASION ON TEXAS RANGES . . .



Cross-hatch indicates mesquite type area; solid black, cedar type.

By H. M. BELL and E. J. DYKSTERHUIS

CEDAR AND MESQUITE are major problems 1 Texas ranges, materially reducing ranch income id lowering the State's potential meat production r the war effort.

These two trees have been invading stealthily vast eas of Texas ranges for years, frequently changing oductive lands to a wilderness of waste. Today it estimated that cedar and mesquite on 51,000,000 res are costing ranchers $40,000,000 each year in st income and reducing the State's potential meat oduction by 400,000,000 pounds annually.

Approximately 45,000,000 acres in Texas have ough mesquite on them to be noticable to the casual oserver. There are about 6,000,000 acres on which dar is more or less abundant. Thousands of acres ljacent to these areas are rapidly becoming infested.

The gradual invasion by these troublesome plants is caused them to go largely unnoticed until they ive become a tremendous problem on thousands of nches. Observations indicate that a mesquite ant is 8 to 12 years old before it is big enough to conspicuous among other shrubs, grasses, and eeds. Cedar must reach an age of 4 to 6 years to be oticeable. Old-timers can recall when areas, now a ooded jungle, were used for roping grounds or lding grounds because they were open and free from ees and shrubs. The fact that these areas have become heavily infested is especially significant when is appreciated that the invasion—the direct result heavy use—has been at the expense of a grass cover hich is no longer produced.

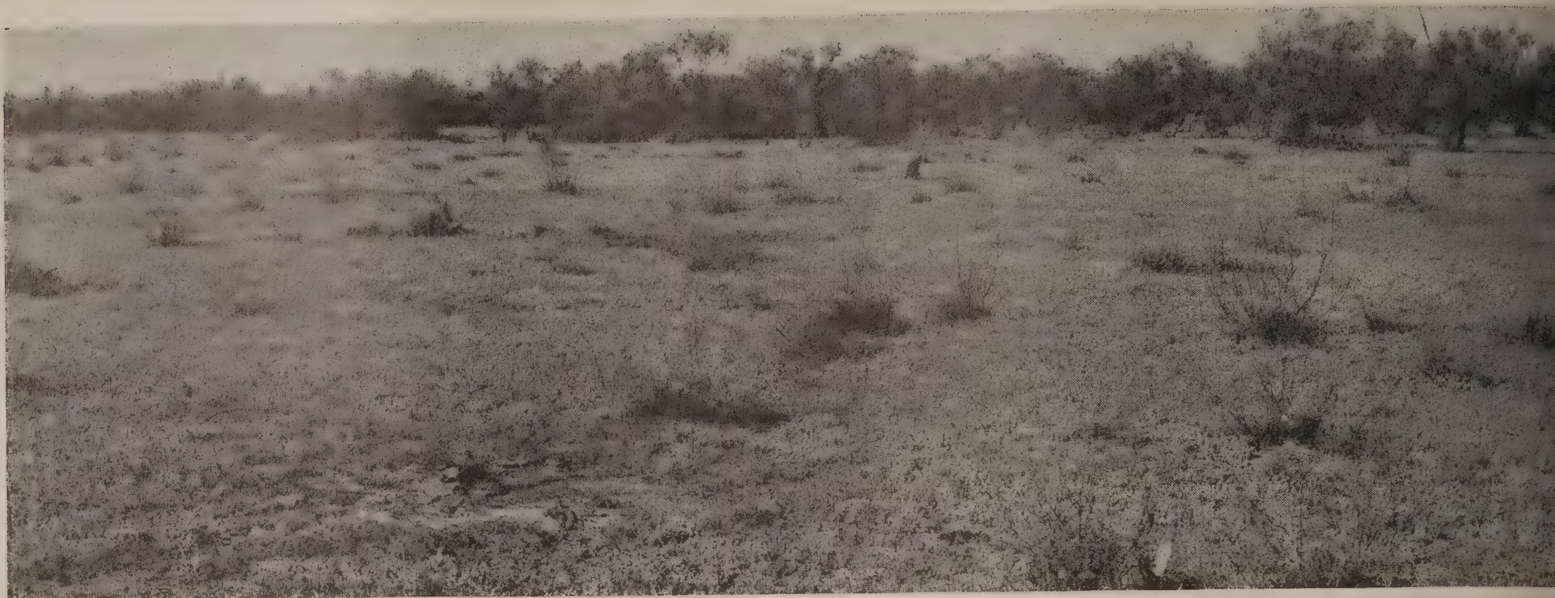
As shown in the accompanying map, areas occued by cedar and mesquite are distributed over a nsiderable portion of the State. Within reasonle limits, variations in climate and elevation have ttle effect on the range of mesquite. However, ithin its range, it is consistently associated with ep, productive soil where soil-moisture conditions e reasonably favorable, as in the valleys and on vel mesas. These are also the best areas for grass production. Cedar, unlike mesquite, makes a dense growth on shallow soils common to the steeper slopes where it is an effective type of cover for runoff and erosion control. Cedar will also do well, however, on the deep, more productive soils. Today cedar occurs on vast areas of soils with gentle slope which, under proper treatment and management, would support grass with more effective use of rainfall and without accelerated erosion.

Numerous surveys or vegetative inventories have been made on mesquite-infested areas and to a lesser extent on cedar areas. These inventories have been correlated with, and substantiated by, actual use records over a period of several years and provide a basis for evaluating the production of these areas. On land where mesquite is growing, the estimated number of acres required to keep one animal unit (one cow or equivalent) varies from 12 to more than 100. In cedar areas the required acres vary from approximately 8 acres to a point of practically no grazing value within a pasture because all the grass is crowded out by cedar. These variations are associated to some extent with climate, elevation, and soil condition, but the major source of variation in grazing capacity is the density of the stand of mesquite or cedar. Checks and estimates of the rate and extent of recovery made following the clearing of infested areas substantiate this conclusion.

From the analysis of sample surveys of typical mesquite areas made in connection with a soil conservation district program and from data of the flood-control-survey program in typical cedar country, it was possible to derive average figures for grazing values. In the North Concho Soil Conservation District an average of 19 acres of mesquite range are required for an animal unit year long. From the Colorado and Concho flood-control surveys it was

EDITOR'S NOTE 1.—The authors are chief, regional range division, d associate range conservationist, respectively, soil conservation vice, Ft. Worth, Tex.

EDITOR'S NOTE 2.—Throughout Texas both the redberry juniper (*J. choti*) and Mexican juniper (*J. mexicana*) as well as Eastern redlar (*J. virginiana*) are universally called "cedar," the common ge employed in the first sentence of this article.



Mesquite country with cleared area in foreground. Most of the stumps show some sprouting.

A type of treedozer used on thousands of acres of mesquite country. The triangular bumper in front is lowered to break and partially uproot stems. The blade completes the uprooting and pushes the material to one side.

estimated that an average of 48 acres of cedar country would be required per animal unit year long. The surveys included all degrees of density of stand. On sites that are well suited to, and very subject to, invasion by cedar or mesquite, but not yet affected, the average number of acres required per unit in the mesquite country is 12, and 23 for the cedar country.

When these average figures are applied to areas in Texas, we have a possible production of 2,368,421 animal units on the mesquite-covered area; whereas, if the mesquite were removed and the area made to produce even an average amount of forage, it would support 3,750,000 animal units. Likewise, the cedar area now supporting 125,000 head of cattle could be made to support 260,870 head.

Considering these areas to be stocked with breeding cows, or their equivalent in breeding sheep, and taking into account normal production, death losses, and replacement, we find quite a wide variation in present and potential beef production.

In the mesquite area the present beef producti would be 626,480,000 pounds; whereas, after cleari and improving the range, it would be possible to pr duce 993,000,000 pounds, or a gain of 366,520,0 pounds. In the cedar area present production estimated at 33,062,000; whereas if it were clear and improved to normal grazing capacity, it wou be possible to produce 69,000,000 pounds of beef, a gain of 35,938,000 pounds. These increases, at cents per pound for beef, would represent a tot value of $36,652,000, or 81 cents per acre per ye for the present mesquite-infested area of the Sta The monetary increase from the cedar area woul be a total of $3,593,800, or 60 cents per acre per ye.

Experience has shown that these increased p acre returns for one year would not nearly cover t per-acre cost of eradication of either mesquite r cedar. However, over a period of years, the cost f the job could be retired.

It would be difficult to arrive at an average ct of eradicating either mesquite or cedar because f the many factors that enter into the cost; nor can t be said that any single method of doing the job s "best" under all conditions. Various agencies a l individuals have given a great deal of thought, ti , and money to methods of eradication.

With cedar, the most satisfactory methods va y with the species involved. The Mexican or mo - tain cedar and Eastern red cedar can be satisfactor y destroyed by cutting or slashing the exposed parts f the tree. Redberry juniper, on the other hand, w l sprout from the undisturbed stump and theref e must be eradicated by destruction of the stump a l more shallow portions of the root system. The ha l axe is probably the most satisfactory tool to use n the first two species. Redberry juniper requi s more elaborate equipment. The ordinary bulldoz ,

Cedar area showing dense original stand at right. Area at left, cleared 5 years ago, now has an abundance of sprouts.

te modified treedozer, and the truck and chain pull method have all been used successfully, but oftentmes quite expensively. Costs of clearing cedar vary fom $1.50 to $15 per acre, depending on the method ued and the density of the stand. There is a compnsatory cash income in the clearing of cedar, partularly the nonsprouting species. High quality fnce posts obtained often have a per acre value eual to, or greater than, the cost of clearing. Fuel wod also has considerable value in all species.

Eradication of mesquite presents more of a probln. In the first place, a large area is involved. Furtermore, persistence of sprouting, the cost per acre c available methods of eradication and the low value c the wood products are limiting factors. Investigtional work is being conducted by the Texas Agricltural Experiment Station and the Operations and Isearch Division of the Soil Conservation Service t determine how the job can best be done. The most pomising methods employed to date are hand grubbng, the use of petroleum oils or poisonous chemical cmpounds, the treedozer, and more recently, the Jques saw. Each has definite limitations, some of wich almost prohibit its use. Hand grubbing is rost certain to result in complete eradication within a relatively few years because all sources of new srouts are removed. The cost may be prohibitive, cpending on the density of stand, cost of labor, con
cion of soil, and size of trees. Cost alone almost lits the use of this method to sparse stands of small pnts. Use of the Jaques saw has the disadvantage tat, for effective eradication, cutting must be follwed by oil or chemical treatment to kill dormant bds and small sprouts which develop later.

Techniques that will insure a high percentage of kl from the application of oils have not yet been prfected. Stands treated with oils commonly show many basal sprouts a year after the original single-stemmed plants have been killed. Too, the labor cost is relatively high. The same difficulties are encountered in the application of chemicals and, in addition, there is the danger to livestock where poisonous materials are used. The use of such materials imposes an added cost because the pasture cannot be used during the time poisonous materials are being applied and until such time as there is no further danger to livestock.

Treedozers have proved quite successful and relatively economical. However, there are limiting factors in their widespread use. The heavy equipment needed is not readily available and it is expensive. Furthermore, much soil and grass is disturbed in the operation because success depends upon completely uprooting each plant. More acres have been treated by this method than by all others combined and many improvements have been made in design of equipment since an ordinary bulldozer was first put to this use.

The Jaques saw, although not yet tried on a large scale, seems to have possibilities because of its relatively low initial cost and its suitability for use on the ordinary farm tractor.

None of the methods thus far used has met the common problem of preventing sprouting or regrowth following the clearing operation. It has been found that the first requisite to a complete job is destruction of all buds, both above and below the ground line. Unless this is done, sprouting is almost certain to occur.

In conclusion, the following points should be given careful consideration if a satisfactory job of cedar and mesquite eradication is to be obtained:

For Mesquite

1. Start first on land that will give the highest return on the investment in the shortest possible time. Productive soil where the stand is not too thick, or the trees too big, is likely to be the best place to start.

Jaques saw—latest addition to brush-clearing devices. The upper bar pushes the crowns forward before the circular saws engaged.

2. Be sure the method used is effective. Completely kill the trees and destroy all remaining buds that may produce a sprout.

3. Disturb soil and grass as little as possible in the operation.

4. Do not overlook small seedling plants. They will be trees in a few years.

5. Where poisonous materials are used, protect the area from livestock until all danger is past. Also use care in applying the solution to avoid danger to men doing the job.

6. Follow up the clearing operation systematically for 2 or 3 years to destroy all sprouts or seedlings that may appear.

7. Practice grazing management on the area to insure maximum development of desirable forage plants and maximum production of forage.

8. Leave brush on the cleared area where desirable to protect the seedling grass plants and insure seed production by older grass plants.

9. Salvage all wood of value for fuel and fence posts.

10. Plan a systematic program of eradication that will t in with normal practical range operations.

For Cedar

In addition to the preceding suggestions concerning m-quite, the following should be considered in a cedar-era-cation program:

1. There is little to be gained from clearing cedar fr steep slopes with shallow soils. It is doubtful that a std of grass readily can be established on such sites.

2. Fire is a dangerous method of clearing cedar. It lea s the soil bare and subject to severe erosion, burns valua e surface organic matter and destroys grass plants and se s.

3. Where the natural source of seed is inadequate to -grass a cleared area, seeds of adapted grasses may be st-tered to good advantage or on favorable sites.

SOIL IS KEY TO CONSERVATION TEACHING IN OHI)

By RAYMOND B. HOWARD

THE TEACHING of conservation in the Buckeye schools is based upon the idea that the protection and restoration of natural resources is vital to training for citizenship. Conservation education becomes an attitude or "way of living." The Ohio plan considers the task of teaching conservation too sweeping and too urgent to be assigned to one teacher, and holds that every teacher should feel a responsibility and interest in the subject.

It does not bring another textbook into an already overcrowded curriculum. It brings facts—frequently using the good earth as a textbook. Facts which can be integrated with, and woven into, many of the subjects already taught in the schools.

Not one individual, therefore, is designated as "le conservation teacher." All are given an opportuny to teach conservation.

The teaching of conservation in the Ohio school is a joint project of the Ohio Division of Conservat n and Natural Resources and the State Departmen f Education. When Don Waters was appointed h d of the Division of Conservation by John W. Bricl r, the new Commissioner revealed that one of the thi gs in the long-range program which he and the Gov r-nor had agreed upon, was this plan of extend g conservation teaching to all of Ohio's schools.

When the Ohio Division of Conservation and N t-ural Resources succeeded the Ohio Division of C n-servation in 1940, through a legislative act sig d by the Governor creating a bipartisan Commiss n

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EDITOR'S NOTE.—The author is director of public relations, Division of Conservation and National Resources, Columbus, Ohio.

empowered to make the appointment of the Commissioner, Mr. Waters was reappointed and this Commission found the new education program well on the way to success.

The first step was to secure the cooperation of the State Department of Education. True, a few Ohio schools had been outstanding in their presentation of conservation. True, material had been previously prepared by the Division of Conservation for the use of both teachers and pupils, but its use without the sanction and the direction of the State Department of Education, had been sporadic.

Ollie E. Fink, who has had a distinguished career as a conservation teacher and who is thoroughly grounded in soil conservation facts, is employed as curriculum supervisor. Arthur R. Harper, well-known naturalist, is the field supervisor. Both are paid by the Ohio Division of Conservation and Natural Resources but work under the supervision largely of the State Department of Education.

A committee of leading educators and conservationists aided in setting up the outline of teaching material. Mr. Harper was charged with the responsibility of spending enough time in various counties to prepare localized teaching material to supplement the State-wide material which was compiled under the direction of Mr. Fink.

Thus, both teachers and students are provided a kind of information about soils, rocks, water resources, timber supplies and wildlife resources of their own community.

"The Teacher Looks at Conservation" and "Conservation for Tomorrow's America" afford a wealth of source material data that may be integrated into regular school courses, and suggest methods of teaching conservation. As rapidly as possible, this is being augmented by localized materials.

For several years the Ohio Conservation Laboratory—a school in the forest—has been conducted for teachers. Through the cosponsorship of Ohio State University it has offered college credit for the successful completion of courses. From this laboratory have come many fine teachers—teachers who have studied conservation on the land itself and who know now that civilization depends upon the proper use of the land.

Even though there may be a desire on the part of both conservationists and educators that conservation be taught in all the schools, the lack of properly trained teachers—teachers who understand the relationship existing in the landscape between soil, water, plants and animals—has retarded the work greatly. The Ohio program has attacked the problem through the Tar Hollow laboratory and through providing helpful printed materials. Personnel has been provided also to assist teachers, local committees and other groups. Condensed into everyday language, this material often contains conservation concepts that would require the reading on the part of the teacher of hundreds of volumes.

Yes, Ohio's conservation education program starts with the soil. Geology becomes something more than rocks, soil and water. Biology becomes something more than plants and animals. Students are acquiring a new conception of the world in which they live. They are recognizing the need to conserve the God-given natural resources upon which civilization becomes either strong or weak.

ENCORES REQUESTED

Dr. Hugh H. Bennett, Chief of the Soil Conservation Service, has made a hit with radio listeners in South Africa.

The Overseas Branch of the Office of War Information tells us that the Chief's broadcast talks to South Africa on soil conservation (Soil Conservation Magazine, August 1943) have been given an "enthusiastic reception."

The talks aroused such widespread interest, in fact, that when one of them failed to come through clearly due to atmospheric conditions, OWI received a request for the entire text to be cabled! This was done and given considerable newspaper publicity, OWI informs us.

Another overseas request for the Chief's talks came from the editor of *Agriculture*, the official journal of the British Ministry of Agriculture and Fisheries. The editor thought "the material of the talks is excellent" and asked for an abridged version of the five broadcasts. The British Embassy sent the abridged version with a preface that started in part:

> The world is greatly indebted to the United States for much of the fundamental work that has been done on soil conservation and not least to Dr. Bennett personally who, like his counterpart in Britain, Sir George Stapledon, holds so strongly to the creed that a nation's soil is its greatest heritage.

Because of the success of these talks in South Africa, where interest in American agricultural methods is keen, OWI has asked for a couple of encores by the Chief, as well as talks by other men in the Department on other phases of agriculture.

Incidentally, Henri Folmer, out in Mountainair, New Mex. (Soil Conservation, April 1943), recently made a recording in Dutch for short-waving to South Africa. He described the work being done by the Soil Conservation Service and by the soil conservation districts in his part of the country.

—EMIL CORWIN.

WAR COMES TO THE "BRIAR PATCH"

(*Continued from page 101*)

to be cut are marked with white paint or with axe marks at 4½ feet above the ground and just above the ground-line. The general goal is to improve growth conditions for the remaining trees so that another cutting can be made in 15 to 20 years.

Before the harvesting program got under way on the project, Wayne Ackerman, project forester, and his assistants had already selected and marked for cutting the trees on several small areas and the project was ready to provide work for many of the small operators in that section who had reached the end of the supply of available stumpage on private lands. A regular inspection of each cutting is made to see that the logger does not waste any merchantable timber. Trees must be cut as close to the ground as possible, generally under 12 inches, and all of the merchantable part of the trees must be used. Branches must be lopped off so that the tops of the trees will lie within 3 feet of the ground and they must be pulled away from standing trees to reduce the fire hazard and prevent beetle damage to remaining trees.

When the sales program was first started it took a lot of effort to convince the sawmill men that they could operate at a profit under Government regulations. Most of the operators were used to the old type of clear cutting on private land, cutting any tree that would make a single "two by four" leaving high stumps, and wasted logs in tree tops. After it was explained to them that the best part of the butt log was left in high stumps and that a few licks with the ax meant another log or stick of pulpwood from the tops, bringing them that much more profit, the operators began to get interested.

As a result of this effort during the past 15 months, 29 sawmills harvested, in addition to the salvage of 1,000,000 feet of storm timber, 6,000,000 board feet of lumber and equivalent units of pulpwood, veneer blocks, and other specialized products. Most of the mills were owned and operated by local residents within or near the project. Each mill employed an average of 18 men for logging, sawing, and hauling, making a total of 482 local people who did gainful wartime work in harvesting this timber.

Most of the cutting took place during the winter when part-time farm labor was available. All the products produced, with the exception of pulpwood, were sold to local wood-using plants working on special war contracts. The project is making careful studies of forested areas and as soon as merchantable timber is located it is marked for cutting and made available for sale.

All this logging is, of course, temporarily upsetting the everyday life of Br'er Rabbit and the other occupants of the "Briar Patch." Eventually, however, through sound forest management, extensive development of grazing and hay lands, and revegetation of gullied, wornout soil, they'll find conditions much more like they were when Joel Chandler Harris wrote his famous stories of the "Briar Patch" country.

LONG VIEW APPLIED TO SHORT-TERM LEASE

A Bucks County, Penn., farmer believes so strongly in soil conservation that he recently installed over 9,000 feet of terracing and 60 acres of strip cropping on a 150-acre tract which he rented on a cash basis for only 1 year.

James Iden Smith has a farm of his own on which he has been following a soil conservation plan for 3 years. This year he figured he could handle more acreage, so he rented 150 acres of unused land from a neighbor, John Price Jones. They signed a 1-year lease. Mr. Smith tore out 100 rods of fencing and removed a lot of brush from one 40-acre field. Then he laid the field out in contour strips and installed 9,300 feet of terraces. He also contour stripped 20 acres more elsewhere on the tract. A Soil Conservation Service technician helped him lay out the lines, and the work was done with ordinary farm equipment plus a small ditcher.

Confidence in increased yields which he expected soil conservation practices would bring made Mr. Smith willing to give time and labor to make these changes on a tract rented for a single year. Confidence in the added protection to his land which soil conservation would bring made Mr. Jones, the owner, willing to permit the changes. The owner was also interested because he thought that the conservation measures would help prevent low water and silting in farm ponds located on his place.

Perhaps Mr. Smith's interest in progressive farming is inherited, like his farm, from his great, great grandfather, Joseph Smith, who during the American Revolution invented the first cast iron moldboard plow used in this country. The plow was later patented by Joseph's brother, Robert, in 1800.

FUR BEARERS FIGHT AXIS

(*Continued from page 108*)

ıd often bring about increased yields of fur ımals. Densely vegetated marshes are opened to ıskrats by the construction of level or blocked ı:hes, designed not to drain the marsh but to enable tl animals to utilize more of the area. Water con-ıl structures have permitted consistently high yılds of pelts by maintaining the vegetation in a ıdition most suitable for fur animals.

The piling of brush, rocks, stumps, and other un-wnted materials in odd spots on the farm may repay tl extra haulage in terms of furs. If placed not fa from water, dens are created that may be used b skunks, opossums, raccoons, and mink.

Artificial dens provide a temporary home for many fur bearers, which, though expensive and not so useful in the long run as land improvements, nevertheless, may prove interesting and productive for the ardent trapper. Old tiles sunk in the ground and nest boxes in trees are often useful. Records show that the former provide attractive dens for striped and spotted skunks, weasels, mink, opossums, raccoons, and cottontails, while nest boxes are "home" to 'coons and 'possums.

The 3–F's have gone to war—and with a little help more of them can join the battle—to the profit and recreation of American farmers.

"MILE-A-MINUTE" CLUB

As a result of consistently plugging the virtues of kılzu on a half-hour daily radio program over Stati n WAGA, Atlanta, Ga., Channing Cope, manager o the agricultural division of a large electric power cc pany, has organized the Kudzu Club of Georgia w h 600 members, which he expects to increase to 2,)0 members by January 1.

Mr. Cope not only gets up before dawn during tl week to present the program at 6 o'clock, but h also practices on his own farm near Newton, Ga., w at he preaches to his early morning audience. Mmbers of the club are pledged to help neighbors g kudzu started on their farms.

I have long been an advocate of easy farming tl ough the use of pastures, kudzu, sericea, and tr s," he says. "It is not idle dreaming to say that if ve had a million acres of Georgia land wrapped u in kudzu, we would have one of the richest and m st desirable states in the union."

CONTOUR-CORN CHAMPION SOUGHT

Indiana State Champion Best Yield 5 Acres of C n Planted on the Contour" is the inscription on a n victory trophy offered this year by the Indiana C n Growers' Association. It is believed to be the fi t State yield award for contoured corn.

Rules for the contest are the same as for the as-sciation's regular annual 5-acre corn contest except tl t the corn must be on the approximate contour on sl es of 2 percent or more. It may be grown in fields w re strip cropping or terracing is practiced. Farme who enter the contour contest also are eligible t compete in the over-all class.

The trophy—a gilded victory figure on a walnut base—was purchased by donations from Soil Conservation Service personnel in Indiana. It was on display several months at soil conservation district offices over the State. The presentation will be made at the annual corn growers' banquet which is held each year at Purdue University.

OVER THE TOP IN BOND CAMPAIGN

As this issue goes to press, the final report on the participation of Soil Conservation Service employees in the Third War Savings Bond campaign is released.

Joining Dr. H. H. Bennett, Chief of the Service, in felicitations, the committee in charge "extends congratulations to our employees for having answered the Government's call for funds by making cash purchases of bonds during this drive of 27 per cent above the quota established for the Service."

The story is told in the tabulation below:

Report on the Third War Bond Drive—Cash Purchases of Bonds

	Quota	*Bond purchases*	*Percent of quota*
Region 1	$29, 085	$29, 869	102. 7
Region 2	68, 248	86, 951	127. 4
Region 3	49, 343	65, 037	131. 8
Region 4	68, 743	93, 456	135. 9
Region 5	37, 442	53, 492	142. 9
Region 6	35, 112	48, 893	139. 2
Region 7	31, 943	33, 329	104. 3
Beltsville	14, 055	13, 325	94. 8
Regions and Beltsville	333, 971	424, 352	127. 1
Washington	20, 376	25, 493	125. 1
Service	354, 347	449, 845	127. 0

REVIEWS

THE AMERICAN LAND—Its History and Its Uses. By William R. Van Dersal. Pp. xvi plus 215; 64 pl. September 1943

By Paul B. Sears

This is a book by a clever and industrious lad, who works systematically and writes clearly. He has had unusual opportunities, because of his work with the Soil Conservation Service, to become acquainted with the useful plants of the United States, and the varied landscape upon which they are produced. Because of his ecological training and doubtless, too, because of the comprehensive program of the Service of which he is such a valued member, he has a sense of historical sweep, and of the movement of human activity across the United States.

His thesis appears to be (1) that the land is the concern of every one of us, (2) that appreciation of the land is a matter for the intelligence as well as the feelings, and (3) that, for all of its Old World origins, American culture is working toward something distinctively American. To all of which I say, Amen.

Let him speak for himself. "The story we are about to tell of American land and the way it is used has about it some points that have escaped many historians. The development of America has not been altogether the simple business of transplanting European culture to a new land and making it flourish. There are too many things basically different in America for that. The fact is that ways of life are shaped in good part by the kinds of places in which men live. The story of America is actually one of growth away from Europe, toward a way of life fitted to a new environment, and because this is so, eventually the European settlers of America changed quite as much as they changed the landscape. And ever since, although there are still to be found many traces of European culture in America, Americans have steadily moved away, just as the frontier did, from the influence of Europe toward a life that is as truly American as the land itself." Well spoken.

Following a brief chapter on the land in the beginning, and one on the present uses of the land, the bulk of the book is taken up by a discussion of the products of that land. After an enumeration and discussion of the many crop, orchard, and garden plants that will delight any connoisseur of seed catalogs, the author turns to range, forest, and wild-life, winding up with a brief, but first-rate discussion of erosion and new methods of land use and management.

Not only has he included history that is not in the books, but a great deal of botany that is meticulously kept out of most courses in that gentle but essential science. No part of the study of plants has any greater intrinsic interest than the origins and development of cultivated plants. In admirably condensed form, much of it will be found here, insofar as it applies to the American scene.

No gardener breathes with a soul so dead that he will not get a wallop from the main part of the book. Here will be found the most recent ideas on the South American origin of maize, the story of the long struggle to produce good grapes in Vinland and its final solution by American mutations, the benefits to the native American strawberry of a long sojourn in European gardens, and many another—all of which I commend to anyone who has ever had loam under his fingernails.

The illustrations deserve especial mention. The selection is superb, the photography leaves nothing to be desired, and the cuts, which are bled off the page to give maximum enlargement, are of a uniformly fine quality which reflects great credit upon the publisher. If there exists an award for achievement in the field of visual education, the author should have it.

Dr. Van Dersal portrays a landscape of almost unbelievable richness and promise. But the discerning reader will presently discover that all of this is contingent upon how we behave. Without recrimination, enough of our past mistakes and their consequences are described to sober the most sanguine and heedless. Enough of our magnificent achievements are described to give us hope. Blandly but thoroughly, the book puts every one of us on the spot.

I have read somewhere of a professor who became interested in the social significance of Walt Disney's work, and who went to interview the maestro about it. Disney listened, and then replied, "Hell, Doc, I don't know anything about that. All I try to do is to make a good film." Having this story in mind, I am reluctant to discuss the author's ultimate purpose. Nevertheless his book is a document for all Americans—urban as well as rural. His is a cool and detached evangelism which will carry conviction by its quiet piling up of evidence.

For REFERENCE

Compiled by ETTA G. ROGERS, Publications Unit

Fld offices should submit requests on Form SCS–37, in ccordance with the instructions on the reverse side of he form. Others should address the office of issue.

SOIL CONSERVATION SERVICE

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MRS. BUILDS THE STOKSTAD TERRACES

By F. G. LOYD

Mrs. Lewis O. Stokstad, farm wife, operates a tractor pulling a binder on terrace she constructed with a plow in the spring of 1942.

Farm wives who know few moments of leisure still find time to give their husbands a lift with the field work these busy, war-time days. They do all manner of "men's work," but Mrs. Lewis O. Stokstad is one of the very few who has built terraces with a plow.

During the morning milking one day last spring, Mrs. Stokstad volunteered to build one-half mile of terraces when the project seemed destined to fall through for lack of time and labor.

"Don't worry about getting those terraces built," she said confidently, "I'll do them myself after I get the breakfast table cleared."

And she did, in spite of the fact that the only terraces she had seen previously were on the Alpine slopes in Europe where she had vacationed one summer during her school teaching days.

The plan that the Stokstads had worked out with the assistance of the Dane county, Wis., soil conservation district, called for construction of terraces in the 20-acre field to be seeded to oats last spring. Cornelius V. R. Pond and Alva A. Lattimer of the conservation district staff, designed and staked out the terrace system. Mrs. Stokstad did the rest.

Mrs. Stokstad's accomplishment emphasizes the progress the Service has made in the last 10 years in simplifying ways of getting soil conservation practices on the land.

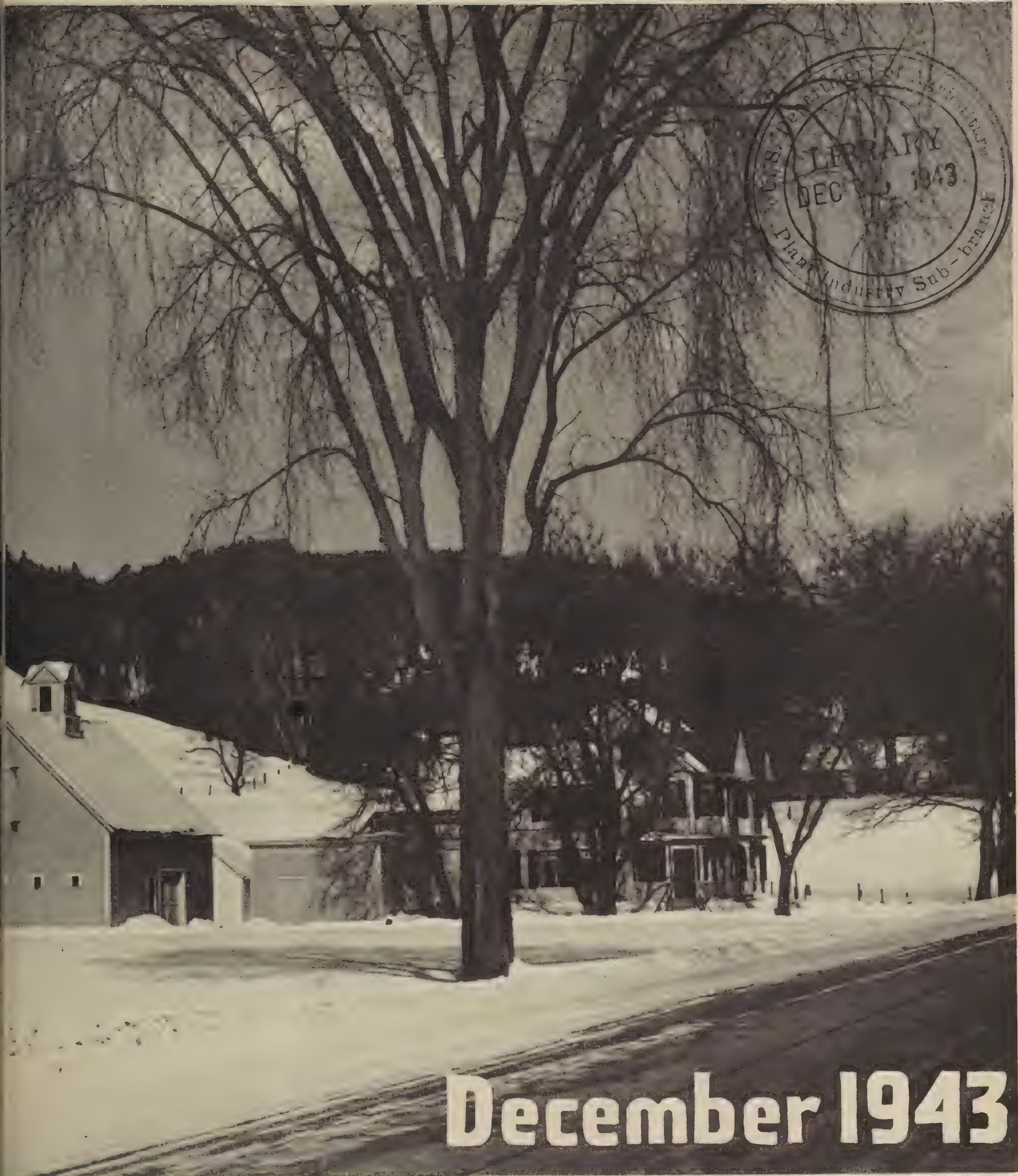
In the Service's early days terraces were built only with heavy and special machinery, but now, as Mrs. Stokstad has demonstrated, they can be built by anyone who can handle a tractor and plow.

When the oats were ready to harvest this former Owosso, Mich., school teacher was on the job again (see photo).

The Stokstads are dairy farmers, with a herd of 48 purebred Guernseys that includes 20 milkers. Before they were married, Stokstad was on the show circuit as herdsman for some of the finest strings of Guernseys in the country.

But now they are back in the rural community southeast of Madison, Wis., where they grew up on neighboring farms. They are raising a family and making a go of farming on their own 120-acre place, although, as Mrs. Stokstad said with a reminiscent twinkle in her dark eyes, "At first it was a little hard for Lewis to forget we didn't have all the money that some of his former employers had."

Editor's Note.—The author is head, regional current information section, Soil Conservation Service, Milwaukee, Wis.



OIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

D STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

Contents

WELLINGTON BRINK
EDITOR

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SOIL CONSERVATIONISTS

BY WILLIAM R. VAN DERSAL AND VERNA C. MOHAGEN

Six years before the Nazis marched on Poland and 8 years before Japan struck at Pearl Harbor, a handful of people began a long-time battle to save American land from despoliation. That handful grew in size and went through the spasms of development characteristic of any growing organization, but it emerged with one clear and steadfast idea—that American land was worth fighting for.

In the months immediately following Pearl Harbor, the handful that had grown finally to be the Soil Conservation Service undertook to fight for America in a new way. By every means at its command and with the willing help of hundreds of thousands of farmers, it reshaped its program of action in such a way as to accomplish the greatest possible production of food needed for war. To the armed forces of the Nation it gave a full fifth of its manpower, and to other agencies set up to carry on emergency programs of the war, it loaned nearly a fourth of its experienced people.

Today some 15,000 soil conservationists wage war on the enemies of their country. More than 9,000 trained conservationists are at work assisting farmers to produce agricultural products vital to the conduct of the war; nearly 2,700 conservationists—men and women—fight with the Army and Navy on battlefronts around the globe; and 3,000 other conservationists labor in a dozen agencies producing rubber, increasing food production in foreign countries, carrying on lend-lease activities, distributing food, mapping strategic areas, and performing a hundred other tasks that go to make up the waging of total war. But however and wherever soil conservationists serve their country, each one still has steadfastly in mind the idea that American land is worth fighting for. The conservationists in uniform or in other war agencies have not been lost from the Service. On the contrary, here is a sharing of manpower, technical ability, and administrative experience in a period of great national emergency, and a spreading of conservationists all over the world.

EDITOR'S NOTE.—The authors are chief and assistant chief, respectively, of the personnel management division, Soil Conservation Service, Washington, D. C.

The Service takes no chance on losing touch with its members—women and men—on the war front. From every region and from Washington there go out at periodic intervals personal letters and mimeographed circulars to each conservationist in uniform, telling of what goes on at home. These bits are received and read in the foggy Aleutians, in the wilderness of the Alaska Highway, in the jungle outposts of India and China, in the shade of palms on the islands of the Pacific, in the desert wastes of Africa, and in the camps of England, Sicily, and the United States.

Return letters bespeak glowing appreciation of the news from home, and show, too, that military exploits have not changed the concern of conservationists for proper use of land.

"I wish every American could see the lessons of India and China as to soil erosion. Proud, mighty, and ancient people reduced through loss of resources (soil primarily) to military impotency and economic poverty beyond the average American's comprehension * * *"—so writes Capt. Ralph Wilcox, formerly assistant regional forester at Milwaukee, now with a bomber squadron.

From Lt. R. J. Nesbit, formerly camp superintendent, now in North Africa: "Erosion is severe along the entire coast. Contouring and terracing would be easy. * * * I believe we could easily swing into a soil conservation program with the natives after the war. If the vineyards were on the contour, it would help considerably."

From Hawaii Capt. S. E. Bowman (former district conservationist) writes that "Not long ago I saw a pasture of several thousand acres made up almost entirely of familiar grasses, that was * * * on the slope of a historic volcano and miles long without a trace of erosion. The slope was 15–20 percent and in an area of high rainfall."

And in England—"So far I haven't seen any gullies or any wasted land * * *" says Lt. J. McKee, former conservation aid.

Hundreds of letters reach the Service from its men in the forces every month. And that they are still part of the Soil Conservation Service these men well know. By this time 196 have been given grade promotions *in absentia*. Consideration is given to every conservationist in the armed forces for promotion in civilian ranks whenever Service positions develop for which they are qualified. Official notifications sent them on the front contain a brief description of their new job, so that between knocking out Japs or pushing Nazis out of Italy they can be turning over in their minds the big job in store for them when they come marching home again.

Every man and woman in the armed forces knows that jobs are waiting for them at the war's conclusion. There is triple assurance of that. Not only has the President announced it as a national policy and Congress passed a law about it, but the Chief of the Soil Conservation Service, expressing the will of the 9,000 conservationists at home, has given his personal assurance as well.

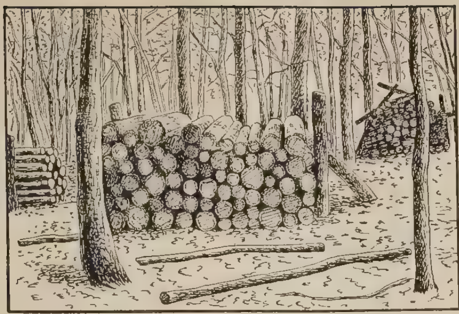
Back home inevitable changes in the home front organization have meant that many jobs have automatically become obsolete. Some of these were occu-

Soil Conservation Service Employees on Military Furlough

Washington	72
Beltsville	93
Northeastern Region (1)	149
Southeastern Region (2)	667
Upper Mississippi Region (3)	308
Western Gulf Region (4)	582
Northern Great Plains Region (5)	294
Southwestern Region (6)	247
Pacific Region (7)	218
Total	2,630

Conservationists Who Have Died in Their Country's Service Since Pearl Harbor

	Former headquarters
Clifford Wayland	Washington, D. C.
Nance D. Stark	Southeastern Region (2).
Noel A. Brown	Western Gulf Region (4).
Chester L. Buoy, Jr	Do.
George A. Lunt	Southwestern Region (6).
J. Ray McCorkle	Do.
James D. Mobley	Do.
John A. Simons	Do.
Loren E. Thompson	Do.
Otto E. Kneuer	Pacific Region (7).



ied by men now in the armed forces. To make the hief's assurance good without delay, action has ong since been under way to place employees furoughed from nonexistent jobs in permanent posiions elsewhere in the Service. This is done also *in bsentia*, of course, and the jobs are actually filled for he duration by war service employees. Going still urther—a few of the conservationists in uniform hemselves held war service appointments. And while there exists no legal protection for these men, he Service expects to do everything it can to find place for them in soil conservation work after the var.

That there is cooperation in the war job is well ttested by the work of one lieutenant, formerly in he Service, who directs technically trained men onorably discharged from the Army for physical isabilities to the nearest Soil Conservation Service ffice for employment.

At home in the meantime, soil conservationists vork longer and harder at the job of coaxing producion from the American land that the men and vomen in all Allied uniforms may be well provided or. The job is not easy. There are no medals, no niforms, but every day, all day long, they pursue he work of increasing food production on the land o the utmost limits of its capacity to produce.

There has been little time to check results closely. The increases in production average 20 percent or nore throughout the country as a whole. This the home front conservationists know from controlled research work no less than from the thousands of enthusiastic reports of conservation-minded farmers. This crop year, estimated with the rigid conservation of the research specialist, as many as 206 liberty ships of 10,000 tons capacity each could have been filled with the extra food and fiber and oil that came from American land handled under conservation methods. *Extra* products that could not have been grown under old methods. And next year, more.

While conservationists have been at war, soil conservation districts have continued to form as rapidly as ever. Today 935 districts, including a full third of American cropland, have been organized and 137 more are in process of formation. And in every district, farmers and conservationists move forward together in the biggest job they've had since the fight to save American land began.

Conservationists at home went over the top, early in the game, on the war bond drive. Feeling pretty proud of themselves they were, too, until conservationists in uniform wrote to tell of some of them buying bonds with every last dime of their slim pay checks. Or of the battalion in the Pacific that had bought $18,000 worth of bonds by last June, "which is pretty good," according to a fighting conservationist, "considering 90 percent of them have families to support."

But the home front conservationists know that there has never been a time when the Service could render to the Nation a service so great, or so necessary, or so valuable, as it is now doing. Every conservation practice applied now to increase agricultural production means, of course, a saving of soil for future years and a building of security for future generations. There can be no more essential or constructive job than this. And when the time comes that all soil conservationists get together once again, the battle to save American land may be expected to go on to a conclusion as victorious as the war to keep America free.

No chevrons these, but badges of accomplishment on the land.

TODAY'S BOND PURCHASES ASSURE TOMORROW'S TRACTORS

SOIL CONSERVATION DISTRICTS ACQUIRE SIZEABLE PORTFOLIO OF GOVERNMENT SECURITIES

MANY THOUSANDS of dollars have been invested in war bonds by soil conservation districts.

Reports on such investments received by *Soil Conservation* magazine are fragmentary at best, in the absence of a systematic survey, but they are sufficient to indicate the financial support which districts are adding to their production support of the armed forces.

Letters tell the business acumen and patriotic philosophy behind the buying of bonds by districts: (1) Determination to help win the war at home and overseas, to defeat the Axis and lick inflation; (2) hard-headed consideration of safety for surplus funds—prevention of erosion of the district exchequer; (3) the profit motive—thrift idea—cumulative interest that corresponds to "continuing production"; (4) a touch of canny foresight—a look ahead to the time when machinery and other equipment must be replaced, when goods and services not now available will again be obtainable in exchange for ready cash.

A few examples, beginning with New Mexico, where five districts have purchased war bonds—

Mesa Soil Conservation District, Mosquero, N. Mex., has bought a $1,000 bond with money earned from rental of machinery. At redemption time, the money will be used for purchase of new district machinery. The district may buy a few $100 bonds in the future.

Roosevelt Soil Conservation District, Portales, N. Mex., has bought sixteen $25 bonds, using money earned from machinery rental. The district bought its first bond in July 1942, and believes it was one of the first districts in the United States to invest funds in bonds. It plans to buy at least one additional $25 bond each month in the future and will use bonds to purchase post-war machinery.

Upper Hondo Soil Conservation District, Roswell, N. Mex., $300 in bonds. Money from equipment rentals. No definite amount for future bond purchases, but the supervisors expect to invest most of their machinery earnings in bonds. It will use bonds to buy district equipment after the war.

Claunch-Pinto Soil Conservation District, Moun-tainair, N. Mex., three $25 bonds bought from gen-eral funds of district. Future use: "To further so[il] conservation work." Future purchases: One $2[5] bond each month.

Border Soil Conservation District, Portales, N. Mex., one $25 bond, from earnings of district equip-ment. Future purchases: Can't determine because o[f] heavy cost of keeping equipment repaired. Futur[e] use of bonds: "To further district program." Tw[o] districts in Colorado have purchased bonds, a[s] follows:

Smoky Hill Soil Conservation District, Burling-ton, Colo., eight $100 bonds. Source of money: AAA payments, machinery rental, and sublease of Stat[e] lands. Future purchases: $500 during 1944. Futur[e] use of bonds: Machinery replacement and purchas[e].

Southeast Baca Soil Conservation District, Walsh, Colo., has purchased $1,200 series E bonds and $3,00[0] series B bonds from money secured from AAA pay-ments for conservation work. Any additional mone[y] obtained in this way will be invested in bonds, an[d] money will be used to purchase district equipmen[t] when bonds are redeemed.

Swinging back east across the country, we find th[e] Congaree Soil Conservation District in South Caro-lina investing $5,000 in war bonds, planning to fol-low with $1,500 additional in the near future. Th[e] supervisors plan to cash the bonds after the war t[o] buy needed equipment.

A labor shortage in the Wiregrass Soil Conserva-tion District in Alabama prevented the supervisor[s] from making the most efficient use of their tracto[r]. They knew that the tractor, which was in good op-erating condition, could be used to speed the construc-tion of war plants. So they sold the tractor fo[r] $1,500, investing $1,400 of this amount in wa[r]

›nds. After the war, they'll turn the bonds into ¦uipment.

The Thomas Jefferson District in Virginia invested .,334.90 in war bonds and stamps, and the New ¦iver District, also in Virginia, came up valiantly ¦ith the purchase of six $100 bonds. Both these dis-¦icts contemplate buying equipment suited to their ›il conservation programs. Another district in this ¦tate, the James River District, bought ten $100 ›nds, holding in abeyance a decision as to what will › done with the money at maturity.

Over in Mississippi the Claiborne County District ›d the Copiah County District sold heavy equipment ›at was too worn for economical operation and with ›e proceeds pocketed war bonds of $1,800 and $2,300 ›aturity values.

Down in Florida series E war bonds with a matu-¦ity value of $2,500 were acquired by the Ochlocknee ¦iver District, with the plan to hold them at least ›r the duration.

Hoosier State trends are in the same direction. ›he Southwestern Indiana Soil Conservation Dis-¦rict, Evansville, started out with the purchase of ›700 worth of bonds, set up a policy of similarly in-¦esting all district funds in excess of an operating ¦itty of $300. Since adopting this plan the district ¦as added to its list five $100 bonds which were ›ought during the Third War Loan Drive.

In West Virginia where most districts are too new ›o have accumulated financial reserves, the contagion ›s nevertheless taking effect. The Greenbriar Valley ›District was among the first to set aside funds for ›var bond purchases.

The Northern Great Plains Region, noted for ¦lways striking fast and hard and continually, is ›uying bonds with enthusiasm—and dollars well ¦imed at the main target. These dollars were accu-¦aulated from equipment rentals, proceeds from the ¦ale of seed from district seed plots, and in some ¦nstances from the operation of grazing permits. The bond-purchasing accomplishments of representative districts in this area may be summarized as follows:

North Dakota:	
Turtle Mountain Soil Conservation District	$250
Cedar Soil Conservation District	2,500
Arnegard-Alexander Soil Conservation District	200
Nebraska:	
Harlan County Soil Conservation District	300
Otoe Soil Conservation District	500
Kansas:	
Ness County Soil Conservation District	200
Labette County Soil Conservation District	500
Montana:	
Prairie County State Cooperative Grazing District	3,000
Fallon County Cooperative Grazing District	1,500
East Custer Cooperative State Grazing District	1,000

Comparatively meager are the reports from the Far West, although there is ample reason for thinking that district participation in the financial support of the war job is evenly spread throughout the country. It is confirmed, however, that the Asotin Soil Conservation District in Washington some months ago lighted the way to victory with $1,000 worth of greenbacks exchanged for a noble and thrift-significant bond some months ago.

These citations present but part of the story, for district supervisors are busy men with lots of time for the land but little time for the letters. They are sufficient, however, to emphasize the affinity of conservation of the soil, conservation of the people, and conservation of civilization. It is an affinity apparent in the agricultural action program of today. Bond purchases by districts speak well for the foresight, wisdom and downright patriotism of the men and women who farm that the world may eat and survive and roll on to better days.

—Wellington Brink.

CHINA'S FARMS FIGHT

By WALTER C. LOWDERMILK

This is the first of several letters from Dr. Lowdermilk that will be published in "Soil Conservation." The author is Assistant Chief of the Soil Conservation Service, presently engaged in China as agricultural advisor to the Chungking Government. (See Editor's Note in January 1943 issue.)

IN MY WANDERINGS over the earth, China remains the most fascinating country of all. China was great when Babylon was great. It has come down to this present time without the usual rise and fall.

This great land, where a fourth of the human race lives, has faced all of the problems of struggle for food and of conflict with the powerful forces of nature. In some areas, by ingenuity and the labor of countless millions, China has won the battle and provided a region with a permanent food supply. Sometimes erosion and floods have won and the people have failed, despite centuries of effort. I have yet to find a major problem of land use but what some ingenious farmers of the past have worked out satistory measures of control, even though on a limited scale. One cannot get away from the fact that the experience of a few thousand years, even this process of trial and error, gives a real head start. Age brings wisdom, even though it is the wisdom that grows out of mistakes of the past. So it is, that the erosion and silt and flood problems of China, after centuries of striving, fairly shout out a warning to us in the United States to establish permanent measures of protection for our lands before it is too late.

During my years in China from 1922 to 1927, the vast western region that is now Free China had not yet been rediscovered. Comparatively little was known about it in the centers of modern progress along the coast. In the United States, the westward trek was gradual, whereas in China the ruthless Japanese invasion plunged 50 millon Chinese, many of them intellectuals, into a headlong race for the pioneer regions—the greatest mass migration in all history. Even here the Japs rode the skies unmolested, and dropped their "iron eggs," as the Chinese say.

Free China was not a region of wide open spaces. It has been occupied for more than 4,000 years, and today it has a population approximately the same as that of the entire United States. Only in the tribal lands and borderlands of Tibet are there underpopulated areas. China's West contains vast undeveloped resources of minerals, water for electric power, flowing salt wells, the possibility of becoming almost self-sufficient.

West China is the Switzerland of China, Szechuan Province is considered the Garden Province. It slopes up against the mighty snow mountains of Tibet, whose first range rises abruptly to 6,000 feet, followed by other ranges reaching 16,000 feet. There are peaks of perpetual glaciers towering to 24,000 feet which, on a clear day, I have been able to see from Chengtu, the capital city. Streams and clouds send down an abundance of water from the mountains and the Province takes on the appearance of one sunken garden after another. Villages are like polka dots, toylike from a plane.

How can I describe the landscape of Szechuan Province? Here every foot has been worked and i-

wo views of one of the areas chosen for a demonstration. Itwas just sundown and farmers were hastening to finish their sheaves and carry them home, after cutting the harvest by small hand sickles all day.

vorked into a phantasmagoria of fields which form ntricate and bewitching patterns—some purplish ed, prepared for planting; some in standing water etained for the spring planting of rice; some yellow vith rapeseed in flower, others green in wheat or broad beans. The patterns of fields disclose little valleys up to their heads, where a perfect upstream system of water control has been worked out. They appear like amphitheaters. So intricate is the design of field terraces that no erosion is possible except on steep slopes of higher ranges. Why have not our poets, artists, economists, engineers, and agriculturists proclaimed the magnitude of these works? Here I have found a fascinating phenomenon of terrace patterns that surpasses that of the Lebanon Mountains n Syria. It represents the achievements of millions of men through centuries. If ever a people were entitled to a land, to hold and to enjoy, it is the Chinese, who have so fully occupied and used the lands of this well-watered region.

Yes, suddenly, with the stampede of a gold rush, came 50 million people on foot, by wheelbarrow, by houseboat, by junk or by any conveyance possible, with only such personal possessions as could be carried on backs or in bundles. Imagine the food problem, the problem of supplying the essential needs of this great pilgrimage which was accomplished in but one brief year or two. There were practically no avenues of transportation to bring in supplies, no industrial machinery to take care of even the former local demands.

It is here, under these circumstances, that the Chinese have held the line for democracy. It is here that they have accounted for more than a million dead Japs and have held down about a million live ones—this in spite of unpreparedness. The Chinese never surrender. They fight to the limit of their equipment and endurance, and fall back to fight

A remarkable mulch of gravel is used on this melon patch. Its purpose is to reduce evaporation in dry northwestern China, and to increase the intake of water. It helps, too, to keep the underlying soil warmer during chilly nights. It is a laborious way to save moisture, for the gravel is hauled from a distance. After 30 years, when it becomes too mixed with soil, it is sifted out and entirely new gravel mulch is put on—about 4 inches deep. The Chinese farmers, who learn many things by experience, say that irrigation with muddy water will quickly ruin such fields.

China's land must support a double population, supply food for the living and provide space for a host of ancestors. The more land occupied by an ancestor, the greater the reverence. When interpreted through its results of expensive funerals and of valuable lands appropriated by the dead, ancestor worship is seen as a heavy yoke. It makes dead men into gods who require space and respect not accorded to the living.

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some more. Now, they are fighting with their backs to the literal wall—the Tibetan Mountains.

Free China is a big country, and the Chinese are a big people. They are generous to a fault, slow to anger and quick to forgive. They love freedom, and the Japs have found that they make poor slaves. For freedom they fight furiously.

On top of more than 5 million killed, more than a third civilians, and an estimated 2 million orphans and billions of dollars in property losses, China has been saddled with a byproduct of war which is almost as bad. The inflation in China today is staggering. Once we could exchange our gold dollars for Chinese money and live far better than we could on the same amount in the United States. Now all that has been reversed. The Chinese could exchange their money, come to our country, and live far better than they could under inflation in Free China.

There is no rationing. Anyone can buy anything there is to buy if he has the cash. Stores are open, but stocks are very low. A bottle of ink costing 10 cents at home costs $2 in United States or $40 in Chinese money. A friend of mine sold a shirt which has been laundered twice, for $25 in our money. A second-hand pair of shoes, well repaired, sold for $65 United States money or $1,300 Chinese. A jacket which could be bought in America for $12 was sold for $85 United States or $1,700 Chinese. A bar of soap costs 50 cents in United States money, a needle 50 cents, a razor blade $1.

Paper is scarce and hard to get. I paid $15 Chinese money or about 75 cents United States for three pieces of red paper and five small pieces of string to wrap up a gift. Gasoline is $12.50 to $15 per gallon in United States money, except in the north where a poor grade of oil is produced. In lieu of this, alcohol, wood, charcoal or even sometimes camphor is used to run autos and trucks. A suit of clothes sells for $400 to $500 in United States money or $8,000 to $10,000 in Chinese money. A missionary sold a bicycle he had used for 10 years for $600 United States money.

Food, under inflation, even when locally grown, is beyond reach of those who do not have the cash. Previous to the war, one bought 60 eggs for $1. Now, under inflation, one egg costs $1.80 Chinese money—an increase of 108 times, or 10,000 percent. Rice prices have increased even more. I paid $3, United States money, for a small bag of oranges right where they were grown. After traveling in the spring, with no fruit, I saw some early grapes, not quite ripe, but three small bunches cost me $1.50 United States money. My great thrill, after going without fruit for weeks on a country trip, came when I stopped at a mission station, found within the compound wall an apricot tree full of tree-ripened fruit and was told to eat all I could. Only twice during this 5 months' trip did I have a cup of coffee, and that was with missionaries who had brought it out from furlough and kept it for special occasions. I would not like to say how many times my mouth has watered for a breakfast of fruit, bacon, eggs, toast, and jelly, as week after week, my breakfast consisted of noodles, pickled and salted vegetables, and perhaps an egg and tea. In the extreme northwest region, no rice is grown and the "staff of life" is cereal products. How I have missed having a bit of sugar in my diet! But we have with us vitamin tablets and do not really suffer for body-building foods, but the poor Chinese, especially those of the white-collar class and students, are many times emaciated for lack of proper food. They cannot live on their salaries. Banks and Government departments often augment salaries with an allotment of rice. One of my former students, a Ph. D. engineer, told me that he and his wife actually were relieved when their 20-month-old son died, because they did not see how they could possibly raise him. This, from a Chinese steeped in ancestor worship and the desire for sons, shows the devastating influence of inflation.

But with all the hardships of inflation and of years of continual bombing, the most remarkable thing to me is the energy and go-ahead urge of this people. Everyone is busy, even to the children. Everyone wants to do something for China. Even in the remote areas, peasants are building roads and carrying military loads. When the Japs invaded, they seized or destroyed about 90 percent of China's industry. Before their arrival, Chinese workmen loaded tools and machine parts on their backs and transported enough of them to the interior to keep up a supply of small arms and certain necessary war materials, sufficient to hold off the Japs.

One of the phenomena of our times is the development of the Chinese industrial cooperatives. Thousands of young men are being trained to organize and supervise cooperative units. They are working out machinery simple enough to be made locally, and yet give efficient and adequate output. They have improved the Ghandi spinning wheel and put improvements onto the early American type and on former Chinese spinning methods. Cooperatives are placed in proximity to raw materials so that only finished articles need transportation. They are placed in homes, in temples, in caves, and in country villages. Many essential ones are close to the Japanese lines in the guerilla areas. When the Japs advance, the Chinese workers are warned by the guerillas. They put the machinery on their backs and make off with it into the hills until danger is past. Individuals could

ıll machinery or parts at tremendous profits, but is never done. The cooperatives supply millions dollars' worth of essential needs monthly and are aining tens of thousands of Chinese in industry, t they are decentralized and not exploitive. Here a demonstration of how China may be able to go rough her industrial revolution without all the ffering and problems which were experienced in estern nations. There are many regions of subsistace farming on steep slopes and erosion-devastated eas, where there must be a difficult period when ople are not free to till the soil but must bring it ıck to forests or managed grazing. It appears that ıese industrial cooperatives may, at least in part, idge over the transition period.

The Chinese are in many ways like us, they do a t of laughing and singing. They laugh at and eny the same things we do. Their great sense of umor helps keep up their morale. They believe in ıdividuality and in the dignity of man. They are ıe most adaptable people on earth. They have an xpression, "giang jew", which means "make the best f the situation" or "adapt yourself" and in this the hinese have revealed themselves as the world's exerts.

One of the most fascinating and gripping stories f this war period is how 642 students and professors f the University of Nanking, where I spent my first years in China helping in the departments of Forestry and Agriculture, fled from Nanking to Free hina. They took hundreds of boxes of University quipment and books and limited themselves to what ersonal baggage could be carried. Just an hour fter they left the dock, Jap planes came over and ank two ships. Twenty minutes after their boat eft Ichang to go up through the Yangtse gorges, the ap planes sank several ships which had been docked eside them. Then came the tedious trials of transhipping all this university and personal baggage rom Chunking to Chengtu, 250 miles further inland. Yet not one box or trunk was lost, and the only damge was mildew on some books which had gotten vet on a junk that struck a rock in the rapids of he Yangtse gorges. Only a few test tubes were oroken.

With great difficulty the School of Agriculture had orocured some fine strain milk cows from other counries. If left in Nanking, the Japs would have conıscated them, so the cows also started off on the ong trek to Free China, accompanied by attendants. t took months, but in time the cows arrived, and I ave pictures of them contentedly mowing the grass n the university campus in Chengtu, apparently none he worse for their 1,500-mile walk and a little hitchhiking on small boats.

It is thrilling to see the way the Chinese, with years of training abroad, are facing the lack of almost everything deemed necessary—and making good. Here in Chengtu, the capitol of Szechuan Province, are about 33 universities and colleges. Most of faculties and students literally put their books and equipment on their backs and laboriously trekked from the coastal cities to Free China. They are carrying on with the largest enrollments in history.

I saw a pile of boxes, and Dean Fen of the Central Chinese University of Nanking told me that they had packed and hauled 10,000 such boxes from Nanking to Chungking. During the clear weather they moved their laboratories into the country temples to carry on in spite of Japanese bombing. A soils man apologized for the cramped surroundings, but not for the work.

This is the spirit of the New China. We of the west may well look to our laurels when this great people really gets going. It is to our advantage to keep China as our friend. Dr. H. H. Kung expressed his pleasure at our willingness to come to the assistance of China in scientific and technical matters, and assured us of his help in whatever we should desire. The Chinese have received me as an old friend, or as a member of the family, with such cordiality that it is sometimes touching. My former students are in active work in agriculture, forestry or flood control, and have been eager to show me the results of their efforts.

One of my former students has charge of a large area assigned to the rehabilitation of wounded or crippled soldiers and to demobilized soldiers. Industries here are not well enough developed to absorb more than a small fraction of the soldiers who will be disbanded at the close of the war. It is on the newly opened up and underpopulated areas in the border lands that we have the best opportunity of starting the application of proper measures for protection of the lands and waters of the region. Here I feel is one of our greatest opportunities to set up effective demonstration areas. In other long occupied areas custom makes it much more difficult to persuade farmers to change from the old ways of land use. I have been called upon to direct the land-use program of many of these newly opened areas. In spite of the present burden of war, China is making definite plans for the future and putting them into effect as rapidly as possible.

I was here for the New Year which coincided with the celebration of the thirtieth anniversary of the founding of the University of Nanking College of Agriculture and Forestry, and for the coincident celebration of the signing the latest treaties between China, Britain, and the United States.

Tireless work has been spent in preparing the Nanking College of Agriculture exhibits. One exhibit dealt with the Penshien area, on which are found the natural features to work out a small T. V. A. project. Erosion is serious on the slopes of mountains that extend in peaks to 10,000 feet, where corn is grown year after year. Following my suggestion, two run-off boxes were prepared to demonstrate with sprinkling to resemble rain, the effect of forest littler in preventing erosion, and the serious erosion that is caused by rain on bare soil on a slope. There were also two model farms showing the contrasts between nonconservation and conservation farming. The erosion experiment worked perfectly, even as the one in Berkeley. It demonstrated to the crowds that jammed one end of the building the menace of erosion. I was interested to see the faces of elderly men, educated men, light up as the significance dawned upon them.

There was a fine exhibit featuring 2905 wheat, a variety developed by the division of agronomy in cooperation with Cornell University and the General Education Board of the Rockefeller Foundation. This wheat has proved to be high in proteins, to make up into better bread, and to yield considerably better than local varieties. It has become very popular and now, after 5 years, is being grown over most of the Province. Methods of control of insects and diseases were also shown. Another exhibit pertained to disease-free silk worm eggs and improvements in sericulture.

In the big gymnasium, all was given over to citrus improvement. This exhibit would match an exhibit of our United States Department of Agriculture. The size of fruit would not equal that of California oranges and tangerines, but the flavor does. Every phase of production, of prevention of disease, of harvesting and transportation was in the exhibit, and the grand finale was a pyramid of oranges. These exhibits brought out the benefits of research.

There were exhibits of tobacco growing, and of corn and potatoes, all products of the new world which have been taken over by the Chinese. Entomology exhibits showed interesting things in insect control. For example, there is the discovery of a fungus that wipes out bedbugs in a few hours. Now it is proposed to spray spores of this fungus in proper places as a measure of control. Formerly, Japan produced most of the pyrethrum, a sort of chrysanthemum that produces an insecticide, but now China is taking steps to produce its own supply.

It seems almost a miracle that the University of Nanking School of Agriculture and Forestry has been able to move, to keep its staff together, its spirit alive, and to increase its enrollment. Everywhere I find Nanking graduates doing important things. I fi that one of my best introductions in China is tha was once on the faculty of Nanking University. is the agricultural fields which have made Nanki prominent. This reflects great credit on Jose Bailey, John Reisner and Dr. Bowen, to have set ing an institution of such fine caliber.

I was invited to the home of the Governor of S chuan in celebration of the signing of treaties tween China, Britain, and the United States. Th were about 250 guests, including 50 foreigners. the wall of the great hall were pictures of the G eralissimo, Roosevelt, and Churchill, and the flags the three countries. The governor made a splend talk to which there were responses from an Americ and a Britisher. A group of Chinese sang "Amer the Beautiful." In the evening we witnessed a col ful parade of lanterns and lighted dragons and f ures, accompanied by firecrackers. The parade end with a big bonfire around which the students gather by the hundreds, sang songs and cheered.

Doubtless wartime conditions in the United Sta have made travel conditions more difficult, but China they are next to impossible. Formerly c chose the date for starting a trip, but the traveler China today is not the one who decides when he to set out. Planes from Chunking to Chengtu a few and uncertain. We waited days for one a finally, after more delay, we obtained reservatio on the most reliable means of travel—the postal tru It is filled with mail bags and the maximum of p sengers who have paid in advance for passage. Th the driver gets for himself all extra fares. We we packed in with sardine compression, each clingi to some valuable parcel. The weather was cold b the "human heaters" kept us from freezing. At fi I was in the front seat, but after getting out to stret my aching bones, I found a woman and a baby in m seat, so I took my turn to be jolted around on t mail bags.

On my second trip between Chunking and Cheng there were 30 of us in a big transport plane, stripp of all comforts and without seats—just flat floor li that of a freight car. Baggage was arranged alo the edges and we sat down as best we could.

West China weather is similar to Washin ton, D. C.—very hot in summer and cold in wint It seems colder here in the winter however, for the is no heat in any of the buildings, and I both e and sleep in all my clothes. The sun never shin then because the great cloud bank piles up against t high mountains of Tibet. We looked forward sunny days, but when they came, I realized they we a sword of Damocles hanging over us.

Shortly after my arrival, while I was at the e

bassy, an air raid alarm sounded. Two balls went up on signal posts telling that Jap planes were in Szechuan and were expected to reach Chunking within half an hour. People were soon on their way to bomb shelters without unusual noise or excitment. Some were on foot, some in sedan chairs or rickshaws, women with boxes or bundles of valuables. Others were hastily catching chickens and ducks, cackling and squawking, to put inside their houses while they were in the shelters. When I smiled in passing, I got cheerful responses. I was interested in the spirit and attitude of the people as they prepared to receive the deadly "iron eggs" of the Japs. People gathered around the openings of dugouts in the sides of hills. There was no hysteria, only grimness. Chunking has built so many shelters in the rock foundations on which it is built that the entire population can scurry to its holes in short order.

But a new day has come for Chungking at long last. American planes and fliers have arrived and the Japs are acquiring a wholesome respect for them. Before the Japs reached Chungking, our fliers were at them furiously and not one Jap plane reached the city.

The Chinese Government has been exceedingly cooperative and for our long trip of 5 months traveling northward, we were provided with a large station wagon with truck wheels which enabled us to go over difficult roads. It was large enough for the driver and myself and eight highly trained Chinese, each representing a different phase of agriculture. Each keeps notes from his particular viewpoint and we shall write a bulletin with joint authorship when we return. When we wished to discuss any area, we had a classroom in the auto.

The first outstanding experience of the trip was my visit to the engineering works at Juan Hsien, constructed by Li Bing and his son Er Wang 2,250 years ago. Their work has unfailingly provided irrigation waters and food for the vast Chengtu Plain, where is maintained the most dense farmland population in the world. Here 6 million Chinese support themselves on less than 500,000 acres, or an average of more than 2,000 to each square mile of soil.

To think of Li Bing is to realize the centuries of stability, intelligence, and genius of our Chinese ally. Before our ancestors had emerged from the forests of northern Europe, wearing wild animal skins, Li Bing had an intelligent understanding of hydraulics and engineering, and had caught the waters of the Min River as they tumble out of the Snow Mountains of Tibet. He cut away the side of a mountain to divert water and interlaced the main channels with canals so that teeming millions for 22 centuries have never

ne head of a great gully which has cut up the valley in this ch loess region of windblown soils in northwestern China milar to the Palouse country of the United States. Giant ngers reach far back into the good earth on either side of the gully, drawing away moisture as well as soil.

ne author hoeing corn with a foot-bound woman refugee om the famine region of Honan. He is showing the way to make basins to hold the rain.

threshing floor in northwestern China. Notice the humps n the skyline. They are not haystacks, but huge tombs, ach covering several acres of rich land for 3,200 years. hose ancients had plenty of land to set aside, but in this rtile and populous region outside Sian the loss of many acres of fertile land is a great tragedy.

suffered a famine or a real flood. He did this as governor of Szechuan Province in the Ching Dynasty, at the very beginning of the long period known as the Golden Age of China. Today these works still provide one of the cheapest irrigation supplies to be found anywhere in the world.

I was impressed with the simplicity of Li Bing's plan, which was completed by his son Er Wang. It has been just this simplicity which has kept it in operation these many centuries. Li Bing is the first engineer I know of whose problem was providing for streambed load or debris, and who had the ingenuity to solve it. He utilized excavation and the simplest and least costly materials—wood, bamboo, and stones picked out of the stream bed, which he built into uncemented but well designed structures to divert water as he chose. Then he prescribed a maintenance system on tablets of stone and built a temple to place it on a religious basis. These provisions have safeguarded the project for more than 2,250 years and would doubtless keep it in operation for another 20 centuries if modern engineers were not eager to utilize the wasted power possibilities and provide increased irrigation by a dam and water storage.

Several intensely interesting days were spent at the annual "opening of the irrigation canals" which was attended by some 40,000 Chinese.

Wherever I have traveled in the steep hill lands and even up the gorge of the Min River, I have found bad examples of land-use and of farmers tilling fields which range up to 100 percent slopes. I posed this question to my staff, "How are we to get these farmers to give up cultivation on steep slopes?" One of the men who had studied in Germany, wanted the Government to lay down strict laws and force the farmers to comply. Such a plan, I observed, could not last long. I tried to get him and the others to see that the only reason that we are interested in conserving land is because we are interested in conserving human resources; that when a farmer on these slopes gets only a fourth as much grain as the farmer in the plain for the same amount of work, we have a waste of such resources. I proposed the hypothesis that China really had her Golden Age back in the years when fewer farmers tilled more land and that this gave rise to more division of labor; that as sizes of farms were reduced by population pressure in a purely agricultural society, the division of labor decreased and brought on a decline in standards of living. The right use of land is our key problem and its solution will go a long way toward solving other problems.

We passed through the salt regions of West China. Afterward we stopped at Jadin to see the giant buddah, carved out of massive red sandstone at the junction of two rivers. The figure is 200 feet in height and the head is 30 feet across. No one seemed to know just how many centuries it had stood there.

We started out from Chingtu on the old road over which Marco Polo must have traveled, but it has been widened into an auto road. The country is varied and beautiful. We passed through a gorge where there is a magnificent dam site, not unlike that of Boulder Dam. Often 50 percent of the slope area with its brown soil had just been planted to corn. The slopes appeared to be tipped up by some giant to spill out the soil, crop and all. At another place the river flowed through a natural tunnel through rock so that all that would be necessary to make a dam would be to plug the tunnel opening. On every slope telltale benching had grown over, showing abandoned fields, whereas other benches constituted cultivated fields up to 2,000 feet above the river.

I am spending most of my time in the northwest, because slope cultivation is the big problem of this area. It is a distinct misuse of land and of manpower that farms it. Buck's survey shows that a farmer must work three to four times as hard and as long to produce the same amount of grain as does the farmer in the lowlands where fields are irrigated.

Whenever possible, we stayed with missionaries. That gave us a touch of the homeland. But where available, we also have found China's Travel Service hotels quite satisfactory. In the loess region, we frequently slept in caves. They are cooler in summer and warmer in winter, and are really very comfortable. I have seen some of the most remarkable country, some of the most spectacular scenery—river gorges and mountain peaks through whose passes we traveled at elevations of from 6,000 to 12,000 feet.

While being delayed by rain at Shan Shi Pu, which is the headquarters of the industrial cooperatives, I looked into the cooperatives with great interest. One, a machinist cooperative of 56 members, has a plant powered by an undershot waterwheel run by a mill race of only 3 feet effective head. It develops about 12 horsepower. This waterwheel turns the lathes, the iron planers, drills, and stamp machines. Here machines are made for other cooperatives. Members are paid according to their skills, and at the end of the year each receives a dividend based on his earning powers. This gives incentive to improve skill and workmanship. Nearby were woolen and cotton spinning cooperatives. Wherever we stop, officials invite us to tea to discuss their land problems.

We went out to see the demonstration area for gully control which had been selected. Here we found enormous gullies cutting down through slopes 1,00

et from divide to streambottom. Half the land was t up, destroyed for farming. My staff seemed subued. I laid down some fundamentals, and said that e must have action and a definite program. This ully-riddled landscape has a fascination for me. It as in such country that the idea struck me so forcelly 20 years ago that soil erosion could undermine civilization if not controlled. Now I am back to st the soundness of our judgment in attacking the roblem. I believe we can treat these loess lands to bsorb all the rain that falls. We can also introduce ee crops on a large scale on our demonstration area -walnuts, persimmons, jujube, and apricots, along ur bench terracing banks, and hardy willow, and ms in gully bottoms, to build up and increase the el supply so badly needed here.

First, we classified the land for uses best suited or prolonged safety. Then we designed and applied easures of water conservation to each land class—or farm cultivation, for grazing, and for farm woodlots. Judging from what a few farmers have done here and there, I feel we have a program that will work.

I sit for hours pondering the panorama of these landscapes of fascinating diversity of terraces, long broken down or in the process of breaking, and riddled with these huge gullies which have had a head start by several centuries on our gullies in the Piedmont or in the southwest. It is a tragic struggle between the farmer and unabsorbed rain waters. If we can absorb all the rain in these porous liess soils and do it far enough back of banks to avoid forming sinkholes, we shall have done four important things: (1) Increased crop production, (2) controlled erosion, (3) reduced flood flow, and (4) minimized the silt load of the streams. If we can do all this out here where the situation is more serious than it is in the United States, where China has the manpower, then the experiences will be of inestimable value in the control of our own great gullies.

MANAGING THE WATER FROM THE "ROOF TOP" OF THE NATION

By C. J. FRANCIS

THE WESTERN PART of the Northern Great Plains region—Montana and Wyoming—might be called the "roof top" of the Nation, because it is crossed by the Continental Divide and the several ranges of the Rocky Mountains.

This vast area produces good stands of timber, furnishes summer grazing for livestock and most important of all, is favored by heavy snowfall. Most of the water used for irrigation in the 17 Western States originates there. The many streams rising in that mountainous country flow into three major drainage basins—the Mississippi, the Colorado and the Columbia. The Missouri River, a tributary of the Mississippi River, is formed by the confluence of the Jefferson, Gallatin, and Madison Rivers which head in southwestern Montana. The Green River rises just south of Yellowstone Park and flows south to the Colorado River. The Snake River rises in Yellowstone Park and flows southwest out of Wyoming into Idaho on its way to the Columbia River, while another great tributary of the Columbia, the Clark Fork River, rises in western Montana and is

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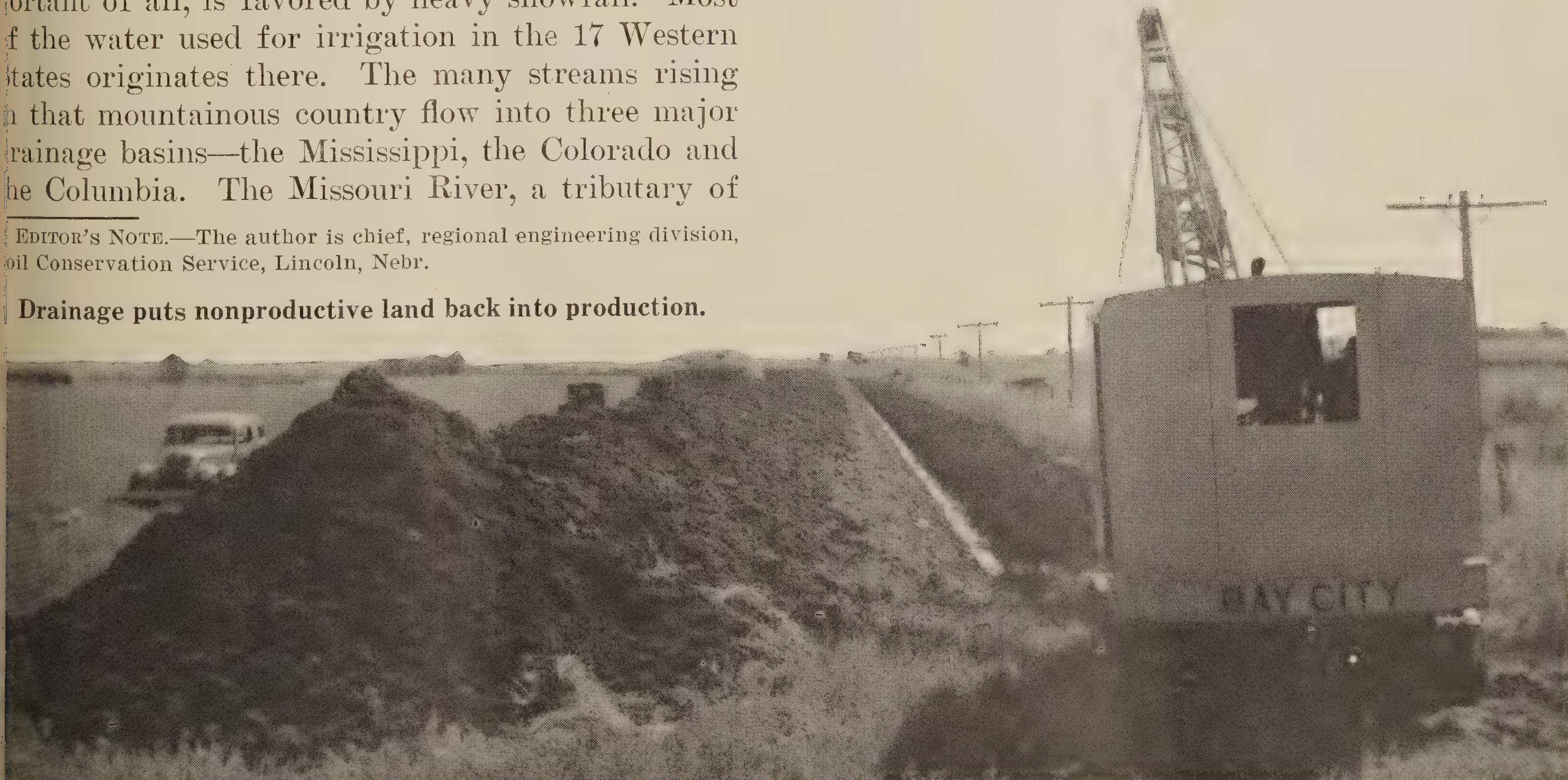
Drainage puts nonproductive land back into production.



Removal of willows at a cost of $7 to $9 per acre boosts production from nothing to 60 bushels of oats per acre.

fed by several large tributaries in Montana during its northwesterly course.

Water flowing from the "roof top" of the Nation must be carefully conserved and wisely used to insure that lands depending on irrigation can take their rightful place in providing the necessary production increases imposed by war.

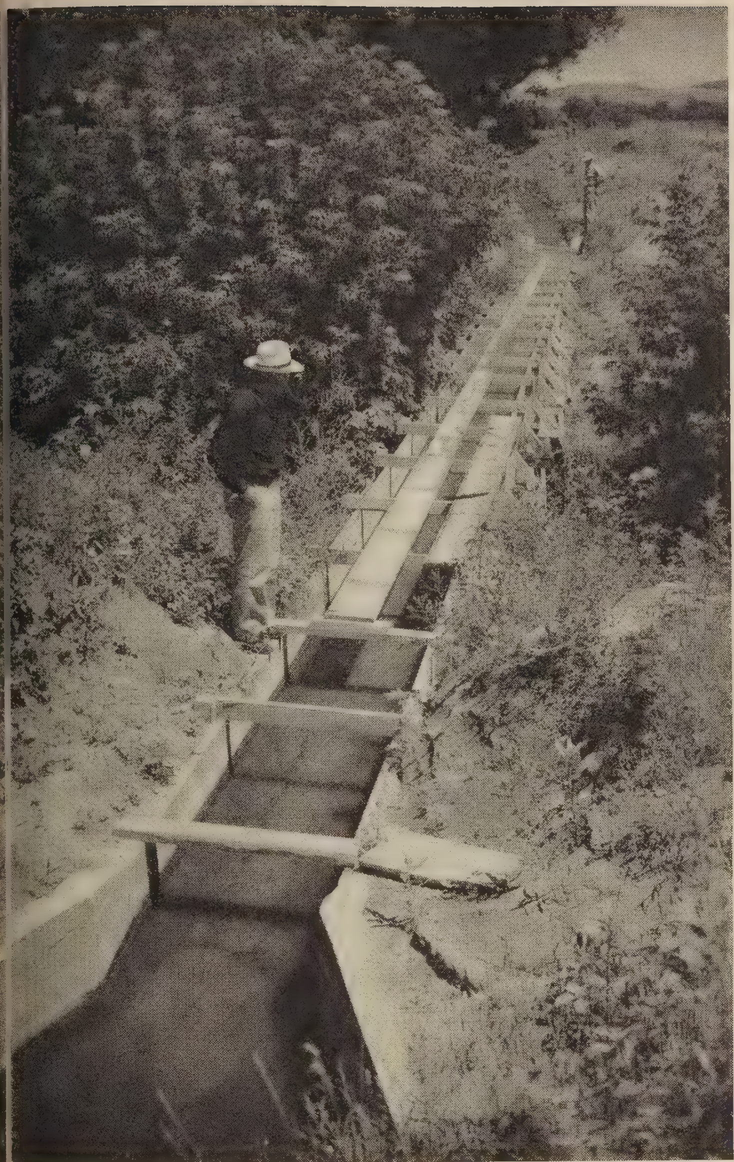
As might be expected, irrigation has been practiced in the western part of the Northern Great Plains region almost from the time of its settlement. Because of the control that can be exercised over irrigation water, it is possible to increase production on a majority of the crops as much as 40 percent over the production obtained under haphazard irrigation methods. Both the district supervisors and the Soil Conservation Service recognize this fact and have emphasized the application of conservation practices relating to the handling of water on irrigated lands.

At present, there are 4 million acres under irrigation in the region, approximately 906,105 acres of which are contained in 41 active soil conservation districts. New districts are being formed and extensive additions are constantly being made to those already established. Farmers and ranchers are quick to see the progress that can be made in solving irrigation and drainage problems through the group approach which is one of the basic precepts of soil conservation district organization. They realize that improvements made to irrigation systems provide maximum production which, in turn, creates a larger net return.

The problems involved in giving assistance to district supervisors in connection with the handling of irrigated lands vary widely. Some of the irrigation systems serve only one farm or ranch, others serve hundreds. The lands range from high mountain meadows devoted to hay production only, to low valley lands where feed and row crops predominate and farming is intensive.

Among the major jobs confronting Soil Conservation Service technicians assisting soil conservation districts are the rehabilitation and construction of irrigation systems on individual farm units, including redesign of ditch systems and building control structures; cleaning and leveling land; acquainting farmers and ranchers with the use and application of water; development of cropping systems balanced with land capability; repair and reconstruction of existing over-all supply systems; planning and building supply systems to bring new land under irrigation, and drainage of seeped land. One of the most important phases of the work consists of the technical help given farmers in handling of the water and land on individual farms. D. A. Williams, irrigation engineer of the Pacific Region, explained this work in his article in the July issue of the Soil Conservation magazine.

A large portion of the work accomplished in this region is applied to individual farms and is handled by the operators themselves through technical service given by the Soil Conservation Service and equipment placed at their disposal by the district supervisors. However, in order for water to be made available to the individual farm unit, it is necessary that a reliable and adequate source of supply be made available. The distribution works of many irrigation systems in the region have fallen into a state of disrepair, making it impossible for farmers to provide the increased food production they seek. The action program of conservation districts affords the best means of handling individual and group problems pertinent to irrigated lands. The acquisition of



T[illegible]s flume made it possible to place 533 acres of land under irrigation.

Leveling land permits utilization of efficient irrigation methods and provides uniform distribution of water, resulting in increased crop production.

[illegible]uipment on a group basis and the provision of tech[illegible]cal services to the community make possible the [illegible]lution of the individual and group problems at [illegible]sonable costs.

The Northern Great Plains region has accomp[illegible]hed a great deal in assisting irrigation farmers [illegible]d the scope of the work is increasing rapidly. The [illegible]st in most instances has been borne wholly by the [illegible]dividual or groups benefited. Shortly after the [illegible]rt of the year the Service allocated funds for spe[illegible]al drainage and irrigation projects of a demonstra[illegible]onal nature. The purpose was to undertake com[illegible]nity type projects rapidly and give special assist[illegible]ce to groups of farmers in order to increase food [illegible]oduction. The major accomplishments include the [illegible]eaning of existing canals to restore their capacity, [illegible]pairing wash-outs in supply canals, rebuilding or [illegible]pairing flume and siphons, lining ditches, clearing [illegible]nd not now in production, and leveling land to [illegible]ovide for efficient irrigation.

Perhaps best illustrative of the effects of clearing [illegible]nd is the work done in the Star Valley Soil Conservation District at Afton, Wyo. Here the district supervisors have been loaned a D–7 tractor and carry-all scraper by the Soil Conservation Service. About 12,000 acres of the valley's best land is willow-covered and unproductive. From the start of the irrigation season on through the construction season, the tractor equipped with a special bulldozer blade designed by technicians of the Soil Conservation Service is used to clear the willow-covered lands. The cost runs $7 to $9 per acre, and the average yield of the land the first year after clearing is 60 bushels of oats per acre. It is estimated that one unit will clear 1,000 acres per year. From the time of the spring break-up until the water is turned into the main canals in May, the tractor and scraper are used to clean the canals of silt and willows to provide the capacity needed. This has made it possible to irrigate properly, and crop production has increased greatly. Costs are borne wholly by the district cooperators using the equipment.

The Popo Agie Soil Conservation District, Lander, Wyo., utilized a tractor loaned them by the Service on ditch cleaning. As this equipment could not meet the requirements of the landowners, a contractor was brought in to speed up construction. One big canal was rehabilitated, involving the movement of 11,100 cubic yards of earth. The job cost $1,301 and benefited 22 farmers. The farmers spent $950 and the Soil Conservation Service, through the district supervisors, contribued $351. A total of 1,800 acres of land was benefited, and the estimated increase in production for 1943 is 28,000 bushels of grain, 1,400 tons of hay, 2,400 animal units of pasture.

Another job in the same area involved the cleaning of a ditch system and replacement of a metal flume 240 feet long. Working through the district supervisors, the Soil Conservation Service agreed to stand

(*Continued on page 142*)

STUBBLE MULCH in the SOUTHERN PIEDMONT

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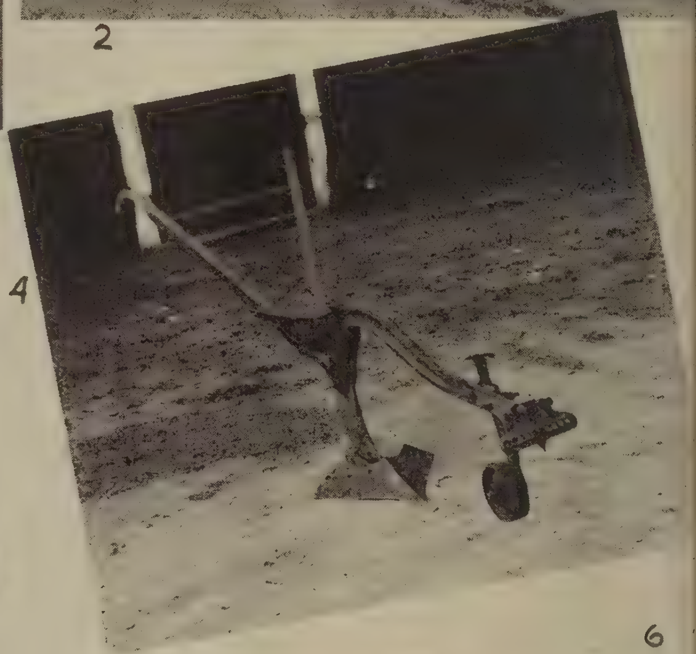

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In the grain lands of the Pacific Northwest and of the Great Plains stubble mulch farming has found wide acceptance. Few recent agricultural innovations have traveled so far or so fast. Crop residues used as stubble mulch are effectively fighting wind damage on hundreds of thousands of acres in the "blow" States, and at the same time are conserving moisture, improving soil structure, and checking run-off. The practice is solidly entrenched in the West as a standard soil-management measure.

Now, when every effort is being brought to bear to increase farm production for war needs, comes this suggestive article from the great research center at Watkinsville, Ga. From this we may gather that in the Southern Piedmont, too, the stubble mulch idea is collecting adherents. Research has gone far enough indeed to indicate trends that warrant serious consideration by progressive Southern farmers. THE EDITOR.

By B. H. HENDRICKSON, JOHN R. CARREKER, WILLIAM E. ADAMS

THE UTILIZATION OF STUBBLE mulches and crop residues involves such factors as the kinds and quantities of residue materials produced, the tools available for the required tillage, and the seedbed requirements of the succeeding crops.

Small grains and most hay crops leave light to crops harvested for seed leave moderate to heavy moderate amounts of residue on the fields. Legume residues, depending largely on stand densities and volumes of stem and leaf growth left on the ground or scattered out when combine-harvested. The legume stubble mulches are richer in nitrogen, and thus more valuable than the nonlegume stubble mulches. Those derived from close-growing types of legumes are more effective for erosion control and for fertilizing. Regardless of harvesting method, most annual farm crops, excepting peanuts, leave roots in the soil to die and decay, whereas perennials persist and gradually develop massive root systems. The more extensive the root systems, the more valuable they are for soil improvement and conservation purposes.

Residues and stubble mulches are available in late spring from winter annuals, and in the fall from summer crops. Tools for stubble land preparation in the Southeastern Piedmont include principally turn plows, disk-tillers, rippers and scooter-plows, and harrows of various types.

EDITOR'S NOTE.—The authors are project supervisor, associate agricultural engineer, and associate agronomist, Soil Conservation Service, Watkinsville, Georgia.

THE PICTURES

1. Volunteer crop of Korean lespedeza seed on a field double-cropped to rye and lespedeza.
2. Harvesting Kobe lespedeza hay.
3. Potato-digger point used for ripping of lespedeza stubble mulch as preparation for following row crops.
4. Two-inch-wide scooter point with braced heel-sweep mounted on a Haimon plowstock—a satisfactory tool for stubble mulch land preparation. It leaves residues on the surface.
5. Tractor-drawn 4-prong ripper satisfactory for spring preparation of lespedeza stubble mulch land for summer row crops.
6. Tractor planting of soybeans in rows on ripped lespedeza stubble mulch land.

Some of the questions regarding tillage of stubble mulches are whether to turn them under, whether to turn them in and only partially cover them, or whether to loosen the soil by shallow ripping so as to leave them practically intact on the surface. In certain crop successions, no tillage at all seems best. Leaching of nitrogenous materials in surface residues due to weathering, and the nature of the decomposition complexes, with special reference to the evolution of nitrates from various residues, are subjects on which more information is needed.

Wheat-straw mulch applied by hand in 1940 to an 11-percent slope run-off plot 70 feet long, which had been disk-harrowed and sown to Kobe lespedeza, showed astonishing ability to reduce erosion to a negligible quantity and to maintain the highest infiltration. The action of the close-growing summer annual, Kobe lespedeza, combined with the mulch, unquestionably enhanced its effectiveness. Starting in April 1940, this plot lost only 1.2 percent of the rainfall as run-off for the remainder of the year, and only 0.24 ton per acre of soil. A companion plot, similarly handled, but without the applied mulch treatment, lost 24.2 percent run-off and 12.62 tons per acre of soil, during the same period.

The value of continued self-mulching has been shown by the subsequent performance of these two plots, since both of them have remained in pure stands for repeated seed production, leaving the full combine-harvest stubble mulches on the land. Soil and water losses have continued to be very low. They have, in fact, shown by far the best conservation record to date of any method under test on the Station run-off plots, despite the severe erodibility of the site they occupy. In addition, seed production of 282 pounds per acre in 1942 on these two waste-land plots equaled or exceeded the seed yields obtained on the best of the cropland fields.

Hand-applied straw mulching is hardly practical under farm conditions except for small critical areas. The results do show that practically complete control of soil and water loss was obtained even on steep slopes with the topsoil entirely washed away. Under the considerably less erodible conditions of average cropland fields, every approach to this ideal condition that is possible in any practical

cropping system holds high promise of being effective.

A heavy stubble mulch such as that developed by well-established kudzu with only reasonable quantities of hay removed, has provided almost perfect erosion protection and greatly reduced run-off losses. Kudzu residues plowed under have greatly stimulated corn yields on poor land unsuited to corn production by ordinary cropping methods.

The harvesting of all plant growth including roots, as in the case of harvesting peanuts for both nuts and hay, is a serious soil-depleting practice.

On the other hand, when only the seeds of legumes are combine-harvested, there is left on the field nearly all of the plant materials, including leaves, stems, and roots. These residues are relatively rich in nutrient value and have both soil-protective and fertilizing value.

The proper handling of legume residues to utilize the nitrogen released during decomposition is especially important during wartime. The decomposition of soft green plant tissue is rapid when plowed under as green manure in the presence of warmth and moisture which favor the activities of soil fungi and bacteria. Opposite conditions are represented by hard, woody, dead plant residues lying on top of the ground during dry cold weather.

The rapid release of nitrates following the turning under of a summer legume green manuring crop, or of the later green growth following hay cuttings, suggests that fall-planted crops should quickly succeed them in order to utilize the nitrates and prevent them from being lost by leaching.

Lespedeza-stem mulch, as distinguished from the complete leaf and stem residues, has some apparent fertilizing value for the following summer crop. This was shown in Station tests in which the stem-mulch material of second year volunteer Kobe lespedeza seed crop residue was raked off duplicate plots in the fall of 1941, and left in place on adjacent plots. The third-year volunteer lespedeza hay crop that followed was 11 percent larger where it had been subjected to the full effect of residue. In August, when the hay was cut, the stem residues of the last year's crop had virtually all weathered down and disappeared.

Another instance lending support to the belief that lespedeza stem mulch has fertilizing value was shown by applied mulch tests begun in the early spring of 1940 on eroded land sown to Kobe lespedeza. During the first growing season, waste cowpea hay which had already started to rot when applied as a surface mulch stimulated the highest lespedeza hay yield. During the second season, in 1941, the plots in which lespedeza straw, or stem mulch, had been originally applied produced the greatest volunteer hay crop. The plots mulched with cowpea hay were in second place, and the wheat straw and pine straw mulched plots next in order.

Wheat has been grown for several years on large fields as a starting crop following weedland or ordinary row-cropping field conditions, and as a second annual, or double crop, in lespedeza fields. When both crops have been combine-harvested in turn, the lespedeza has almost always succeeded as a dense volunteer stand. In the fall of 1940 three fields were seeded to wheat, and several comparable fields were available for comparison in which wheat had been preceded by 2 or 3 years of lespedeza under a stubble-mulching practice. The latter fields produced up to 100 percent higher wheat yields in 1941.

Following three years of the wheat-lespedeza sequence, utilizing all residues for protection and soil improvement, corn in 1941 produced 39.3 and hegari 48.6 bushels per acre as compared with approximately 20 bushels per acre from the same class of land the same season in the usual cotton-corn-cowpea cropping practices.

Cotton, following an early spring turn-under of Korean lespedeza stubble mulch, required no nitrate of soda side dressing to produce the highest cotton yield grown on the station fields in 1941. Corn failed to respond to any additional nitrate side dressings under similar conditions in both good and poor corn growing seasons. In a 3-year stand of kudzu, in which strips were plowed out for corn and large quantities of kudzu stubble mulch turned under, the corn yielded well and did not respond to nitrate side dressings. There is little question that legume stubble mulches are capable of supplying substantial amounts of soil nitrogen for the use of the succeeding crops.

Hegari stubble mulch, probably the heaviest produced during the combine harvest of any grain crops, was removed from parts of two fields, and left in place on the balance of the fields. None of the following winter crops of barley, crimson clover, or of the subsequent summer crops of lespedeza and soybeans was affected perceptibly in stand or yield. The non-legume mulch materials did not produce in the soil any appreciable effect tending to increase crop yields.

These results bear out the contention that practical conservation management of erodible croplands should favor cropping plans that provide for accumulations of legume residues to be left on the land.

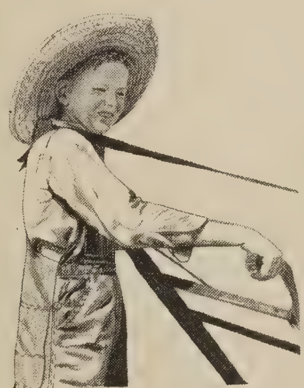
The leaf residue remaining on the land in good stands of sericea, regardless of whether hay or seed

crops, or both, were harvested, has for the past 2 years supplied excellent starting conditions for new overplantings of crimson clover in the fall. This winter clover is often difficult to grow under ordinary cropland conditions. When over-planted in sericea, clover helped to check erosion during the winter and early spring periods, and the combination stand produced a heavy May cutting of very palatable hay.

Crimson clover has succeeded well when sown in soybean and cowpea combine stubble mulch. On the other hand, crimson clover sown in non-legume corn and hegari stubble mulch land in the same field started out well and then died out in one winter. Apparently, nitrates produced by leaching and rapid decomposition of leaf residues of soybeans, cowpeas, sericea and kudzu stimulated crimson clover seedlings sufficiently so that they were more vigorous and better able to resist the effects of fall drouths and early freezes.

Present indications are that a very important application of stubble mulch utilization methods applies to the annual lespedezas and the handling of their residues in row crop rotation for the multiple purpose of obtaining decreased runoff, better erosion resistance, and increased soil productivity. Our data is based largely on 4 years' experience in handling the annual lespedezas in various cropping practices on several hundred acres of typical Southern Piedmont cropland in both row crop rotations and as self-maintained pure stands.

For cropland uses, to obtain the most benefit from the lespedezas there seem to be at least five good rules: (1) make initial plantings in small grain; (2) plant at considerably heavier seeding rates than are generally recommended, never less than 40 and preferably 60 pounds per acre to obtain a full seed crop and as heavy residues as possible the first year; (3) allow at least 2 years' growth of lespedeza to obtain maximum after-effects; (4) cut lespedeza hay early, no later than early-bloom stage if subsequent fall growth before frost is expected to produce a good amount of residue material; if harvested for seed instead of for hay, the maximum amount of residue material will be developed—preferably, the first-year stand is harvested for seed, since this practice practically assures a thick volunteer stand the following year for hay; and (5) turn under the second-year stubble mulch during the winter or in early spring, as the weather permits, to allow for partial decomposition of the residue and settling of the seedbed.



Legumes can help to obtain more efficient use of cropland (1) by developing permanent pastures of grass and clover sod on bottom land, (2) by making possible upland temporary pastures for a succession of small grain and lespedeza or (3) by establishing themselves in sericea, kudzu, or other crops suited for pasturage. Livestock may then pasture off the bulk of the feed they require on as nearly a year-round schedule as possible, thus reducing the need for feeding legume hay and permitting more residues to remain on the fields. Most Southern farms are not adequately equipped to harvest efficiently and store large qantities of hay, yet livestock enterprises are expanding. Handling crops in this manner, the smart farmer can obtain an occasional manuring of some of his temporarily pastured cropland fields and secure added land protection and soil improvement.

On average croplands, if lespedeza, cowpeas, or soybeans are the summer legume crops, and winter cover crops are to follow, the hay-crop stubbles may be turned or disk-tilled and oats drilled in September in order to give oats the early start that it needs for best winter survival. Winter legumes usually would be expected to succeed best as a following crop if sown in the disked hay stubble and covered lightly. After a fall seed crop of lespedeza, soybeans, or cowpeas is combine-harvested, a planting of wheat or winter barley is generally preferable, drilled on a disk-tilled seedbed with the heavier stubble mulch only partially turned under. In the case of Kobe lespedeza, combine-harvested for seed in November, there appears to be little object in following with winter legumes planted so late, since the stubble mulch of lespedeza is known to supply good winter protection and cold weather checks decomposition of surface residues. Experience has shown that turning under of this stubble mulch can proceed at any time weather permits during the winter and early spring months land is being prepared for summer crops.
without inviting undue soil loss by erosion while the

Farmers in the L'aigle Creek Soil Conservation District, Arkansas, have recently invested $6,000 in the construction of more than two dozen ponds for the production of bass and bream, two palatable species of warm water fishes.

SOIL CONSERVATION

CLAUDE R. WICKARD
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CHIEF, SOIL CONSERVATION SERVICE

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MANAGING WATER FROM "ROOF TOP" OF NATION

(*Continued from page 137*)

the cost of rebuilding the flume. As metal was not available and a temporary shortage of lumber existed, the flume was replaced by an earth fill. A total of 4,800 cubic yards of earth was placed in the fill and 9,240 cubic yards of earth was removed from the canal. The Soil Conservation Service contributed $1,950, representing the cost of the earth fill built through contract, and the district expended $1,120 in ditch cleaning operations. Eight farmers were benefited by the construction. If the flume had not been replaced, these farmers would have had to rely on rainfall, which is insufficient in this area to supply crop requirements. The estimated total increase in production resulting from the work is 10,500 bushels of grain, 700 tons of hay, and 1,360 animal units of pasture.

Another example—

The Cook Ditch Association operating within the Lawrence-Butte Soil Conservation District having headquarters at Spearfish, S. Dak., was faced with the loss of irrigation water for 533 acres of land through the failure of a wooden flume. The ditch system connecting with the flume was in need of cleaning to provide the flow required by the land under the ditch. The labor for building the flume was supplied by the farmers themselves, and equipment was loaned to the district for cleaning the ditches. The Soil Conservation Service contributed $131 while the Cook Ditch Association expended $405 to bring the work to completion. Crop production on the 523 acres of land benefited was increased by 96 tons of alfalfa, 200 tons of corn, 1,710 bushels of barley, and 3,100 bushels of potatoes.

The Lawrence-Butte District has a 75-horsepower tractor and carry-all scraper on loan which is used exclusively in heavy leveling operations. There is a large acreage of land in the district requiring extensive leveling if water is to be properly applied. The cost of this work varies from $8 to $15 per acre, depending on the volume of earth that must be moved. There is enough work of this type to keep the equipment busy for several years. All of this type of work is completely paid for by the farmers themselves. This district also has a ⅜-yard combination dragline and shovel which was used throughout the construction season in building drainage ditches. There is a large area of seeped land which is susceptible to drainage at reasonable cost. The construction of adequate drainage systems will put land back into production and greatly increase the crop productive capacity of the district. The rental rate charged by the supervisors is $5.50 per hour, the total expense of which is borne by the cooperator.

These examples serve to show the assistance Service technicians are able to give soil conservation districts in this region. Each district has one or more pieces of heavy equipment that is used continuously during the construction season on projects of this sort. Except for the projects cited, and a small number of similar projects, the entire expense is borne by the farmers and ranchers. Complete records for this year's operations are not yet available but when they are compiled, soil conservation districts in this region will show enormous food increases which can be directly traced to conservation practices applied to the land. Water is the controlling factor in crop production in this region. The policy in the Service is to give its use and control proper consideration in the development of every farm plan.

At the annual meeting of the Audubon Society in New York City, October 19, Dr. H. H. Bennett, Chief, Soil Conservation Service, stressed the importance of soil conservation as an aid to wildlife. Said Dr. Bennett, "Soil conservation farming will double the number of the common birds of the farm. We know this because it has already been done on hundreds of farms throughout the country. When all the farms of the Nation are properly treated for the conservation of soil and water, one result will be a 100-percent increase in bird life. And as a result there will also be, of course, an enormously greater protection of crops from the ravages of insect life."

For REFERENCE

Compiled by ETTA G. ROGERS, Publications Unit

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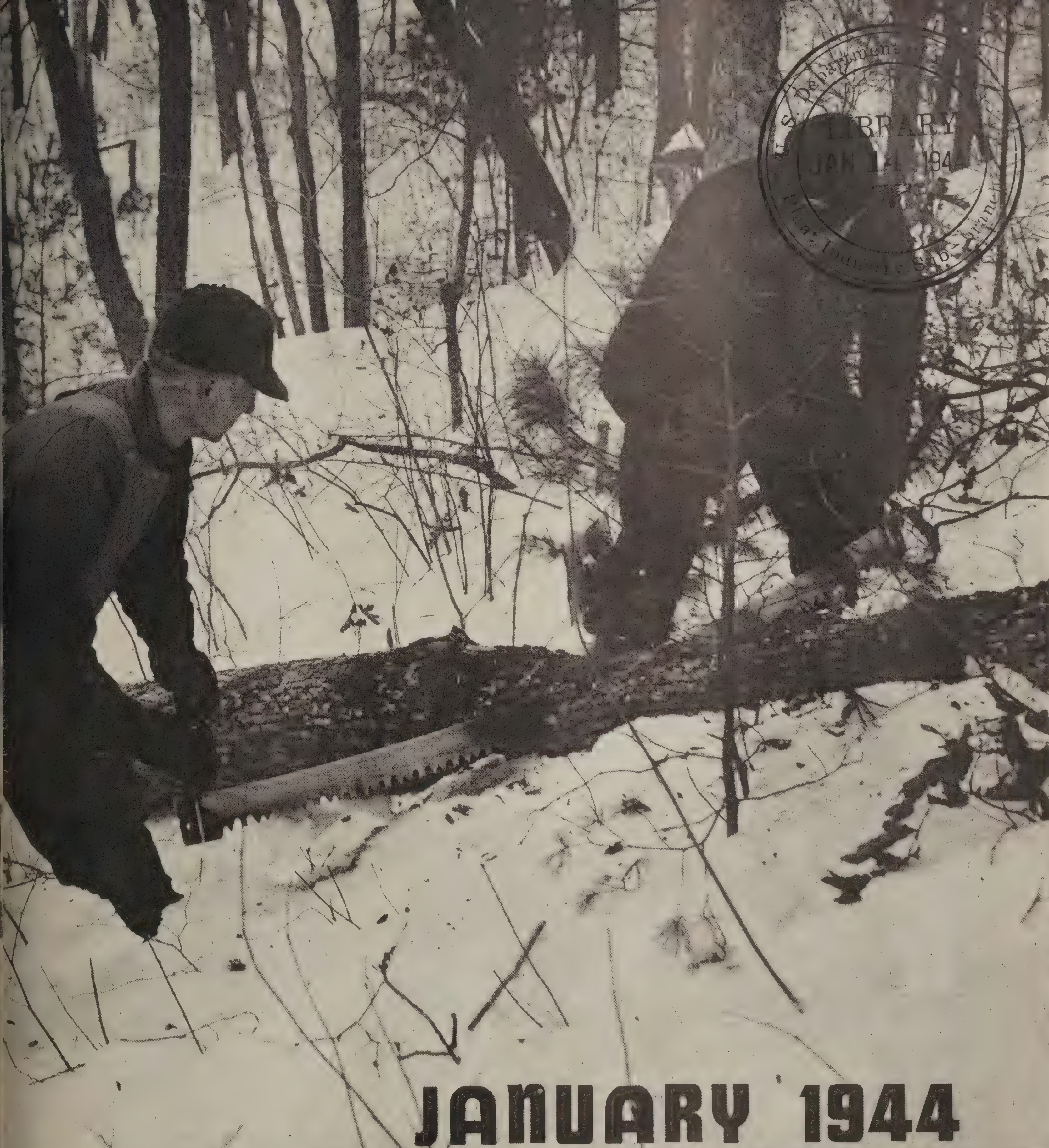
[1] From Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.

Symbolic of good practices is this winter-blanketed New England farmstead. Wooded are the hillsides, to slow the snows for gradual release to thirsty soils. Full are cribs and silos and lofts. Well fed and productive are the bovines of the barns. Buildings reflect the prosperity wrought by proper husbandry of the land. Here is an instrument potent in war and in peace. Any American loving the good loam, and loving the good life of the free, would be proud to call this "home." (Photograph by courtesy of Farm Security Administration.)



JANUARY 1944

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Contents

WELLINGTON BRINK
EDITOR

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CHIEF, SOIL CONSERVATION SERVICE

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COMMITTEE ON SEED PRODUCTION PROGRAM

By GROVER F. BROWN

Secretary Wickard's famous statement that "Food Will Win the War and Write the Peace" is being better understood and appreciated by all people on both sides of the war. Every time a food ration coupon is torn out of a book, or a soldier opens his ration pack or answers the call to chow, or lease-lend food is distributed to the hungry victims of Axis domination, the importance of calories is evident. There is nothing like a full stomach to make the world look brighter—and home worth fighting for.

Milk, butter, cheese, eggs, meats, leather, and many other foods and food products depend on a plentiful supply of grass and legume seeds. Crop yields are largely in proportion to the amount and quality of the seeds used to establish the crops. High-yielding pastures can't be possible without a seed source of the best adapted grasses and legumes that go to make up the vegetative population.

Soil conservation is largely dependent upon the density of the vegetative ground cover, whether that cover be cotton, corn, potatoes, hay, or pasture. Land that is producing highest yields of any crop is doing so partly because it is protected from soil and water losses; at the same time, because of the high yields, there will automatically ensue less soil and water loss. Land that is producing maximum yields has such a heavy above-ground canopy and so many roots that the soil receives much more protection than it would from the production of a weakling crop.

It has become increasingly more evident that if adequate guidance and emphasis are to be given the Nation's seed programs, those in charge of such programs must have the best available advice and information. There are a number of agencies in the Department of Agriculture that have quite detailed and complete information on various phases but to bring such scattered parts of the picture together so that a

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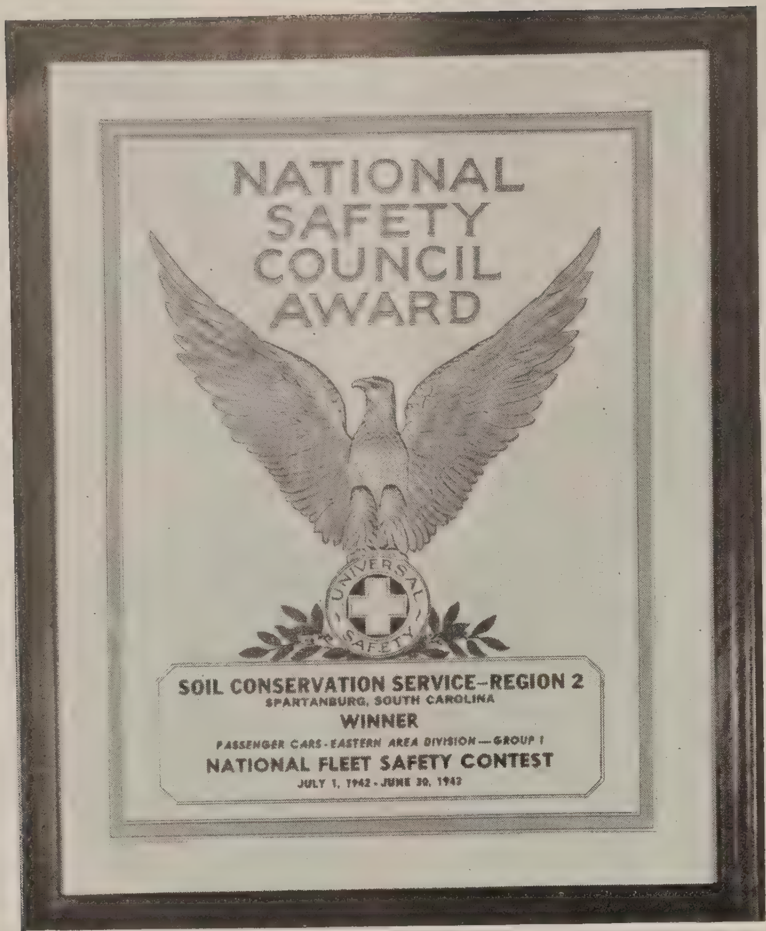
Editor's Note.—The writer is assistant chief, division of agronomy, Soil Conservation Service, Washington, D. C.

Charles R. Enlow
Chief, Agronomy Division, Soil Conservation Service

Mr. Enlow has had a distinguished and colorful career. Probably no one knows more intimately the agriculture of the United States or the psychology of the American farmer. He was a flying officer-instructor in France in the first World War, is a valued advisor on agronomic problems connected with airfields in the second World War.

A key figure in the Nation's soil conservation program, Mr. Enlow enjoys an international reputation as an expert on grasses and legumes. In 1934 he hunted through Turkey and Turkistan in search of plants suited to erosion control on dry lands. In 1937 he participated in the International Grassland Congress in England, visited also Scotland, Wales, and France.

Mr. Enlow is a frequent contributor to scientific journals, and has also written for magazines of wide general circulation.



CONSERVATION BECOMES A HABIT

At the National Safety Congress recently held in Chicago, the southeastern region of the Soil Conservation Service was for the second successive year awarded a plaque in honor of having won the National Safety Council's annual passenger-car contest.

This region, with headquarters at Spartanburg, S. C., established the enviable record of having only 0.18 automotive accidents for each 100,000 miles driven by Government passenger cars during the year ending June 30, 1943. This accident frequency is considerably better than the rate of 0.22 accidents per 100,000 miles which won the contest in the previous year, and is equivalent to more than 180 cross country trips from coast to coast for each passenger car accident which occurred.

On learning of the award, Secretary Wickard expressed his satisfaction in a memorandum addressed to Dr. Bennett:

> A number of factors must be considered in any attempt to evaluate the true worth of such an achievement to the Department and to the Government service as a whole.
>
> First, vehicle accidents have been the cause of the greatest number of serious and fatal injuries to employees for many years. Achieving the lowest accident rate for passenger cars in the eastern territory means that losses of manpower, equipment, money and materials have been prevented.
>
> Second, the awards have been won in competition with fleets in private industry, thereby enhancing Department prestige as well as that of all Government service.
>
> Third, the awards have been won during a time when there was a large turn-over in maintenance-men and drivers.
>
> Fourth, winning the award in 2 consecutive years proves that they have been justly earned by hard work and close attention to a well organized safety program.
>
> I wish to congratulate you and every person in your organization having a part in this achievement and express a hope that this high rating will be maintained. Never before was the conservation of manpower, equipment, and material so important.

A FIRST CLASS IDEA, TOO

Johnnie Overman, 22, is a first class seaman at the U. S. Destroyer Base at San Diego, Calif., right now. But when Johnnie comes marching home to Baldwin County, Ga., after his present job is over, he's going to be a first-class farmer, and you may lay to that.

Johnnie's father, John Overman, Sr., bought a 200-acre farm recently with the idea of letting Johnnie take over when he came home. But Johnnie, who had spent 18 months in a CCC camp before he entered the service, wrote back that if he were going to operate the farm he wanted to do it his own way and didn't want any one-crop cotton farming.

So Mr. Overman worked out a farm plan with the assistance of the Piedmont Soil Conservation District which emphasized the production of feed and development of improved pastures to provide a sound basis for livestock farming. A copy of the plan, signed by Mr. Overman, was sent to Johnnie for his approval, and Johnnie signed on the dotted line.

A NEW FISHPOND BULLETIN

Just off the Government press is Miscellaneous Publication No. 528, Techniques of Fishpond Management. Written by Lawrence V. Compton, once associate biologist in region 6, now second lieutenant, U. S. Army Engineers, this 22-page publication represents the first printed review of the pertinent literature on fish farming as practiced in this country. Here for the land manager and progressive farmer are gathered together in summary form information about species of fish best adapted to pond conditions, rates of stocking, kinds of pond water fertilizers, both commercial and organic, and other notes on what is known about the subject. Tabulations and photographic illustrations, together with a bibliography, help to make the publication of unusual aid to the technician who wishes to obtain a background for productively integrating fish management in ponds and reservoirs with other phases of complete conservation plans for American farms and ranches.

Walnut for Gunstocks

The best log shipped to market from the forestry project during the year—13 feet long, 33 inches in diameter. It brought the farmer $202.52.

By A. H. CROSBY

Many forest products are classed as critical for war, but black walnut, because of its value for gunstocks, probably heads the list. It holds its position because all of the great discoveries in wood utilization and plastics during the quarter-century since World War I have failed to develop a satisfactory substitute for walnut for gunstocks.

So, today walnut is sought again in tremendous quantities for gunstock material, a hunt made no easier by the 25 years of unsystematic management and marketing which has been the rule since the last war. Its high place among the fine furniture woods led to the continued exploitation of the walnut supply; permitted it no opportunity to recoup after the inroads of wartime cutting.

Getting the walnut to market in quantities needed at present is not easy. Except where they have been planted, walnut trees do not occur in pure stands. Instead, they are scattered among the native timber in farm woodlands throughout the eastern United States. This story is applicable to woodlands along the Missouri River and its tributaries in southeastern and central Nebraska, and in eastern Kansas. Most of the walnut found today is second-growth.

The scattered stands and diffused ownership have made buying costs high. The prices usually offered to the farmer do not yield enough to make management of walnut seem worth while to a man busy raising cultivated crops. Buyers, who were in effect middlemen, have scouted out desirable trees, then offered the farmer a lump sum low enough to enable them to sell to the mills at a good profit. Under this hit-and-miss marketing system, there is little incentive except patriotism for the farmer to try to get his walnut to market, and his patriotism is under full test anyway in meeting the wartime food requirements.

Consequently, one of the important war jobs the Soil Conservation Service is doing in the walnut country along the Missouri River is in connection with the farm forestry projects, where good management and systematic marketing are being brought to the fore, and where sellers and buyers are being brought together in a way beneficial to both. It is admitted that the area covered by the projects is limited, but their influence is spreading.

EDITOR'S NOTE.—The author is farm forester, Soil Conservation Service, Humboldt, Nebr.

The progress made in the farm forestry project in Richardson and Pawnee Counties, Nebr., is indicative of what is happening.

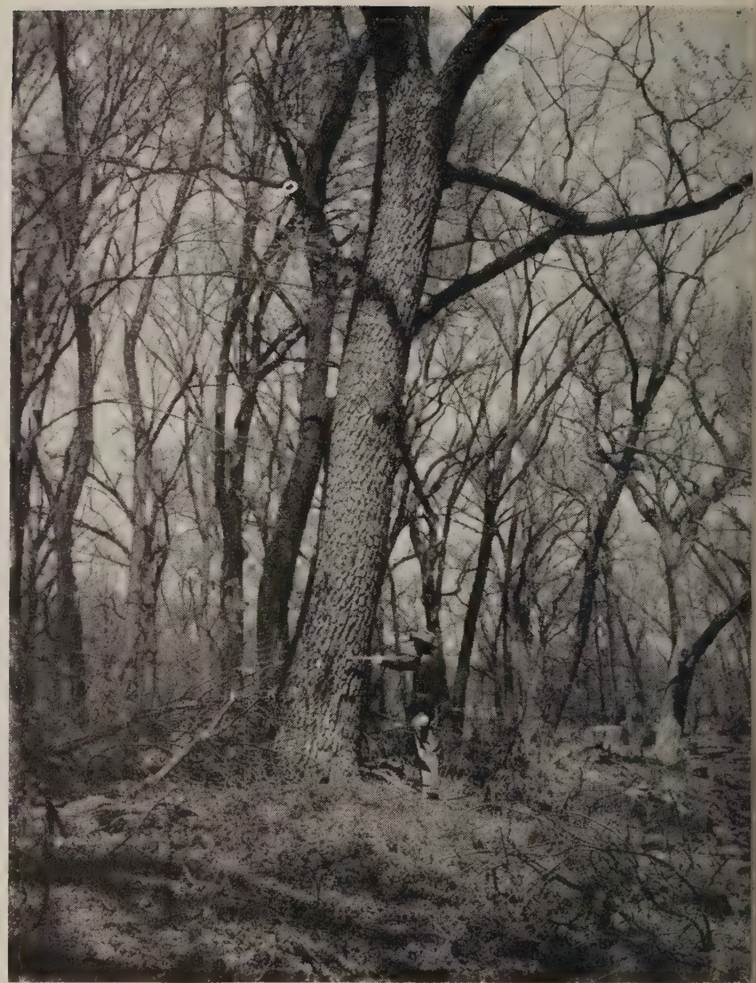
It is doubtful if anyone knows today how much walnut remains in the Great Plains Region. Certainly there were considerable quantities, but the early settlers used much for rough lumber, fence posts and fuel. Still more was destroyed in land clearing. Since then, walnut has been cut pretty generally wherever it was found and the farmer was willing to accept the price offered. No supervision was exercised over cutting, and many small trees which by now would have yielded good timber were sacrificed.

Probably the most important effect of such practices is to make the management of the leftover species unprofitable and hence farm woodland management has made little progress in this section. Walnut represents the cream of the crop. If managed as one species in a mixed stand of oak, ash, basswood, elm, and boxelder, the cutting of all these species along with the walnut as they become ripe is not only possible but profitable. The big money tree is, of course, walnut. The associated species make excellent lumber for farm and local market use and provide posts and fuel. Walnut management is therefore the key to woodland management wherever it grows.

So far as the Nebraska farm forestry project is concerned, the farmers now have a fairly definite knowledge of their walnut timber resources. Conceding that the amounts within the project are representative of the rest of the walnut-producing area, this part of the country can furnish its share of the walnut needed for gunstocks and still have young trees coming along to meet future requirements. That is, if good management is practiced.

Besides ascertaining the amount of walnut—and other commercial timber as well—in the project, the Soil Conservation Service foresters also had to find out the names and locations of all industries using walnut logs and lumber; types of product and costs and methods of manufacture; marketable sizes and grades of logs and unit prices; and costs of logging, hauling, trucking, loading and freight. These ascertained, a fair value could be set on stumpage.

It is interesting to note that walnut mill operators, at first reluctant to furnish information, are now cooperators. Their representatives are frequent callers at the project office, seeking information about the industry and assistance in making the purchase of trees. It was these people from whom the information about costs had to be acquired in the first place, for farmers who had sold walnut logs had little idea of the unit prices they received.



One of the better walnut trees sold in the Nebraska far forestry project in 1943. Its appraised value to the farm was in excess of $160.

With the early work of the project out of the way- that is, the starting of demonstrations in manag ment methods—the assistance given to walnut ow ers is now standardized. The owner and the far forester together decide the trees to be sold, bla and number them, and compute the value of eac tree individually. The values are figured on the mi prices for logs, from which are subtracted the cos of logging, hauling, loading, and freight. A reaso able profit is figured for the logger, and in ordinar times the farmer can take advantage of this by log ging his own trees. Because of the present shortag of farm labor, however, logging is done by speci crews.

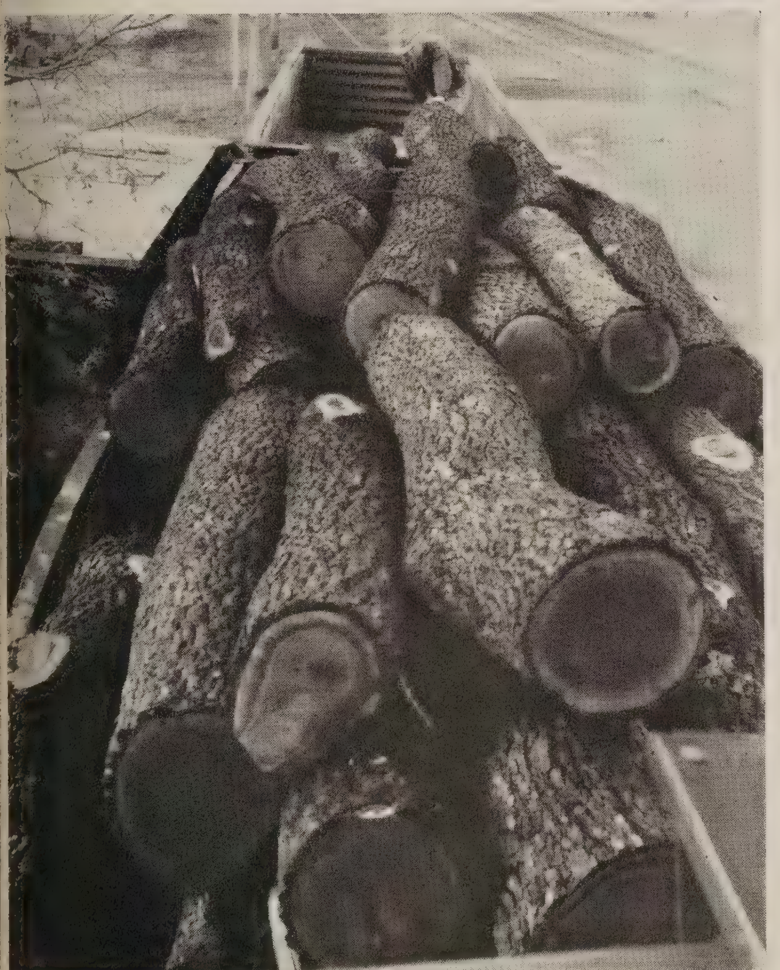
Having a close estimate of the volume of timbe for sale, and a knowledge of its value, the seller in a position to contact interested buyers, a list c whom is maintained at the project office. Ordinaril three to five bids are secured with the price offered b at least one in line with the appraised value. Sal are usually made on a lump-sum basis, but since th volume is known and the trees marked, there is ac tually little difference between this method and sel ing at so much per thousand board feet.

In this way, the farmer realizes a fair return fro his trees and the mills' buying costs are reduced ma

erially by eliminating the necessity of scouting for narketable trees. In a number of sales arranged by he project in the last year, the prices have been considerably above the appraised value. This is due to leed for walnut by manufacturers with war contracts and the difficulty in locating supplies and getting them logged.

The farm forester has already helped 51 farmers n the project, cruising 846 acres and appraising 2,297 walnut trees, containing 340,700 board feet. The appraised value was $22,377.97, or an average of $62.74 per thousand board feet on the stump. Average lumber content per tree was 151 board feet, with a value of $9.74.

An average run of good, clean walnut logs harvested in the forestry project and ready for loading.



Even these smaller, crooked walnut logs have a value of $25 per thousand board feet in the standing tree, and make thinning and the removal of trees of lower quality well worth while.

With the butt log of this walnut tree worth $290 per thousand board feet, a few hours' digging to get the extra length was profitable.

The outstanding sale in 1943, however, involved what is said to be the last remaining virgin stand of walnut in the Middle West and one of the last in the entire country. Situated on the Caleb Callam estate in Pawnee county, the 71 acres on which the sale was made had been owned by the Callams for 60 years. The owners of this timber were not cooperators in the farm forestry project, but the methods which had been demonstrated were followed.

The 195 trees that were sold brought $11,600, an average of nearly $60 per tree, with individuals ranging from $8 to $10 to well over $250. An estimated 80 thousand board feet of logs were shipped with the most valuable log (33 inches by 13 feet) bringing more than $200. Bidding was spirited, with every walnut industry in nearby states anxious to secure these excellent trees.

The Callam sale is important, too, for other reasons. It indicates the possibilities of walnut growing in southeastern Nebraska, although it must be admitted that this was above the average that may be expected. It also shows that the management practices encouraged by the farm forester are taking hold. The Callams sold 195 trees, but equally important, they left in the stand more than 300 of the younger thriftier trees even though they are of commercial size and have an appraised value of more than $5,000.

It has been found that the ability to place a definite value on the smaller trees gives the farmers understandable reasons for keeping them and caring for them. The remaining Callam trees will be marketed later, after they have increased their diameters and consequently can yield a larger percentage of high quality lumber. The increase will be in both quantity and quality.

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PENAL FARM REBUILDS LIVES AND SOIL

Harvesting squash from a 5-acre plot planted in July.

By BARRINGTON KING

Crime, according to J. Edgar Hoover, chief of the Federal Bureau of Investigation, costs the United States an estimated $15,000,000,000 a year. Misuse of land, according to H. H. Bennett, chief of the Soil Conservation Service of the U. S. Department of Agriculture, costs another $3,844,000,000. Aside from the immediate problems of war and the peace to follow, therefore, rehabilitation of misdirected lives and conservation of misused land are two of the principal economic problems facing the Nation today.

Oddly enough, at the Shelby County Penal Farm near Memphis, Tenn., where these two apparently dissimilar problems are being tackled together, it has been found that there is a striking similarity between the rehabilitation of misdirected lives and the conservation of misused land. The basic principle of the whole penal farm program consists o[f] putting every man and every acre to work at th[e] job which the man and the land are best suited t[o] perform.

O. B. Ellis, commissioner of the penal farm, roads and bridges on the Shelby County Commission, believes that the chief reason for the vast amount o[f] eroded, worn-out land in the South today is th[e] extensive use that has been made of steep, erodibl[e] land growing clean-tilled crops like cotton and corn[.] The remedy, he contends, is to keep that kind o[f] land in pasture, close-growing forage crops, or trees[,] and to use only the moderately sloping or leve[l] areas—protected by adequate soil conservation measures—for producing clean-tilled crops. This principle of sound land use is the basis of the soil conservation program in operation on the Shelby County Penal Farm.

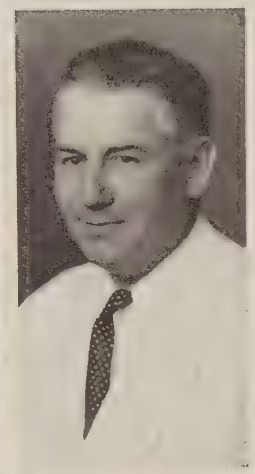
The job of human conservation is being approached similarly. The first step when a new pris[-]

Editor's Note.—The writer is head of the current information section, Soil Conservation Service, Spartanburg, S. C.

Hereford cattle at one of the nine water-storage ponds.

W. B. Ellis.

Dairy herd on Shelby County Penal Farm.



E. W. Hale.

Aberdeen-Angus cattle grazing on supplemental pasture.

oner comes to the penal farm is to determine just what kind of work he is best fitted to perform. After a complete physical examination, Ellis interviews the prisoners one at a time, asking them about jobs they have held, the kind of work they like to do best, what their interests are, and other questions to bring out information about the background of each prisoner that might throw light on his aptitudes and interests. From the notes Ellis takes during the interview, his secretary writes individual letters to all former employers, asking them about the prisoner's attitude, skills, etc.

"We tell them the offense of which the prisoner has been convicted and what his sentence is, and explain that we are trying to get this man back on the right track. Then we ask them to give us all the information they can to help us do a good job," Ellis relates. "You'd be surprised at the responses. The people we write to usually take a genuine interest in trying to do something for these men. They not only give us all the information they can of their own knowledge, but frequently go out of their way to ask other people for additional facts that might be helpful.

"From our personal interviews of prisoners and the information we get from former employers and others, we gain a good idea of the kind of job each man can do best," Ellis continues. "And in the operation of a farm as big as this one, we have a wide variety of jobs from which to choose. Among them are general farm work, tending dairy cattle, beef cattle, and hogs, welding, woodworking, plumbing, heating, electrical work, painting, auto mechanics, and a variety of specialized jobs involved in these various types of work."

The present penal farm, Ellis explains, represents the culmination of a dream of E. W. Hale, chairman and for 32 years a member of the Shelby County Commission, which is the governing body of Shelby County. It was Hale's idea to replace the old county workhouse in Memphis with a farm that would provide a variety of activities for prisoners. Out of this idea has grown the plan for rehabilitation of prisoners through work they are best suited to perform, and application of this same principle of rehabilitation to the land.

The penal farm, Mr. Ellis says, is just one of many outstanding jobs that Mr. Hale has accomplished during his 32 years as head of the county government. Shelby County schools are nationally recognized as outstanding in rural education. The county has more miles of "black top" roads than all the rest of Tennessee combined, exclusive of the State highway system. The Memphis and Shelby County Health Department has won the national award for the past 4 years in the National Health Conservation Contest. The net bonded indebtedness of the county a the present time is only $3,442,093.02, Ellis reports.

In 1928 first 2,000 acres of land for the penal far was purchased, and the main prison unit buil through a million dollar bond issue. The land con sisted largely of worn-out cotton farms. The fir job that confronted county officials was to conve these eroded, run-down farms into productive lan through diversified farming and a sound soil-build ing program. From time to time additional lan was purchased and the plant expanded. The pen farm now comprises 4,600 acres and the land an improvements are valued at $2,500,000. Ellis attri utes the efficient operation of the farm largely Tom Hooker, farm manager, and Wallace Brya dairy and livestock manager.

Something of the scope of present operations indicated by the fact that the farm now carries 1,0 beef cattle, 225 dairy cows, and 3,400 hogs. Grazin for the cattle and other livestock is furnished 1,000 acres of permanent pastures on the steeper are of the farm and 500 acres of rotation pastures on t lowland areas. Another 1,500 acres of bottomlan along the Wolf River, is used for corn, alfalfa, an silage crops, including sorghum and soybean. About 700 acres are in woodland, which furnish lumber for farm building and woodworking jo. The remaining land is devoted largely to hay, supp mental grazing, and vegetable crops.

Sixty Jersey cows and two bulls imported from t Island of Jersey in 1934 at a cost of $34,000 were t foundation of the present herd of 225 dairy catt. This "extravagant expenditure of taxpayers' mone" was severely criticized in 1934, but since that ti more than $85,000 worth of bull calves have been so into 42 States and the herd today is valued at mo than $100,000. The day before our visit the far sold an unborn calf from parents with outstandi pedigrees for $1,000.

The 1,000 beef cattle include 96 registered Ab deen-Angus and purebred and grade Herefor. The 3,400 hogs include Duroc, Hampshires, and Ol Improved Chester breeds. The farm keeps sever jacks and 50 Percheron brood mares and raises s own mule colts. Some 60 mules are kept on t farm, along with the brood mares, for work sto, and seven tractors are also used in the farming op ations.

The farm has a trench silo, capacity 1,700 tons. t is a concrete trench 260 feet long, 25 feet deep, 17 fe wide, surmounted by a substantial frame building protect it against weather. The corn, sorghum, a soybeans produced on 250 acres of crop land are ha vested green, run through a silage cutter, and blo into the huge trench to provide vitamin-rich, hig-

One of the waterways through which water from terraces is conducted into the series of storage ponds.

protein winter feed for the farm livestock. A sign beside the building proclaims it as "the world's largest trench silo."

"If you find a bigger one, let me know and we'll put on an extension," Ellis said.

On a somewhat comparable scale is the farm's sweetpotato curing house—capacity 35,000 bushels. Two crews were busy harvesting and storing potatoes in mid-October. A dehydrating plant, built by the prisoners themselves 4 years ago, before the war made dehydrating popular, is operating in connection with the central heating system. It has a capacity of 150 bushels at a run. A cold storage plant is used for storing apples, onions, peppers, Irish potatoes, cabbage, squash, egg plant, cucumbers, and other produce. Surplus beans are kept there until enough have been accumulated for a dehydrating run.

Victory gardeners who patriotically tended a tenth or a twentieth of an acre of vegetables last year will have a pretty good idea of what it means to care for some 250 acres the penal farm has in truck and vegetable crops. Thirty-five different varieties of vegetables are grown and, in addition to furnishing fresh vegetables for the penal farm and the county hospital, every month in the year except January and February, the farm sells up to $300 worth of vegetables a day on the Memphis market from 100 acres of land irrigated during the late summer, when most other local vegetables fail as a result of dry weather.

Virtually every phase of modern farming operations is demonstrated on the farm and inspection tours are regularly held. Recently the son of President Vargas of Brazil, and several ranchers from Argentina and other South American countries, have been among the visitors. Many U. S. Department

Tomatoes in mid-October on part of the irrigated garden.

of Agriculture officials have visited the farm. The Extension Services of Tennessee and adjoining States, Farm Bureaus, 4–H Clubs, Future Farmer and county agent groups frequently hold tours and field days there. The National Duroc Congress was held at the farm in July, with 1,500 persons attending. Hogs were entered in the event from 24 States and 100 gilts were sold at an average price of $240, with a top price of $2,100.

Hog raising is an important activity and an average of a carload of hogs a week is shipped, in addition to those slaughtered for use on the farm. The two large concrete-floored farrowing barns, which serve as "maternity hospitals" for the hog population, contain 60 individual pens with adjoining concrete-floored runs outside. In one corner of each pen, under a low shelf, a 100-watt electric bulb pro-

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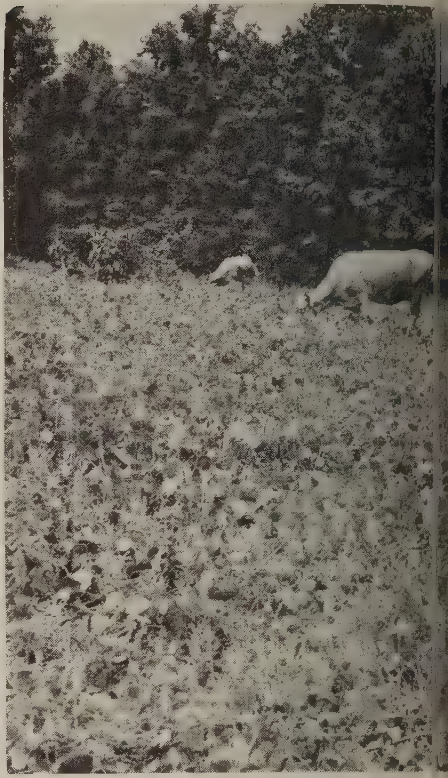
Brown Creek Distri

Milking time on the farm of Adam Lockhart, near Wadesboro. Mr. Lockhart has more than 100 registered Jerseys, an equal number of registered Herefords.



Two acres of kudzu ha
grazing for 17 cows, 3 m

By E. B. GARRETT

A lot of changes have taken place in the five-country area around Wadesboro since the Brown Creek Soil Conservation District was granted a State certificate of organization on August 4, 1937, and became the first farmer-organized, farmer-operated soil conservation district in the United States.

Fields that had washed away under continuous row cropping on land too steep for cultivation have been converted to perennial hay crops of kudzu or sericea lespedeza. Terraces, contour tillage, and improved rotations have been set up on more gently sloping land. Lespedeza in the heavier soils and crotalaria on the sandy areas, along with winter legumes and small grain, are restoring organic matter and fertility to worn out land.

Improvement of permanent pastures has kept pace with the increased production of hay and supplemental grazing provided by small grain, winter legumes, and perennial crops and, with more feed available, district farmers have been able to increase production of hogs, cattle, poultry, and other livestock vital to the war program.

EDITOR'S NOTE.—The author is State conservationist, Soil Conservation Service, Raleigh, N. C.

County Agent J. W. Cameron, who took an active part in getting a demonstration project and CCC camp located in Anson County and later presenting information before the legislature which resulted in passage of the North Carolina districts law, under which the Brown Creek district was organized, sees the work of the district as an educational program, the benefits of which will extend over an indefinite period. But right now, the district is primarily concerned with helping to produce crops needed in the war program.

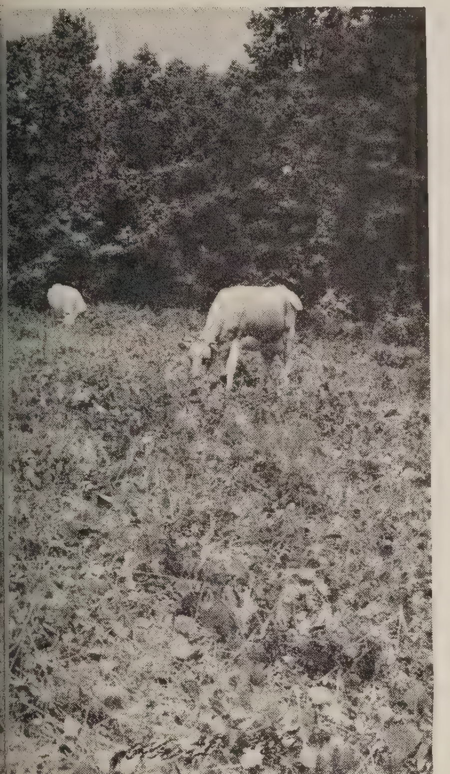
"If we have the soil in good shape, we can grow more war crops and grow them more economically," Cameron points out. "This is especially important now, with the shortage of labor. The more we conserve the soil, the more livestock we are going to produce. Livestock is fundamental to sound farming.

The same idea is expressed by Adam Lockhart, cashier of the Bank of Wadesboro. Lockhart sees livestock as the basis of all agriculture and as a means of keeping young people interested in farming.

"You can't keep young people excited about mechanical farming," he declares. "You've got to have livestock to tie them to the land."

On his own 3,000-acre farm, Mr. Lockhart has more than 200 registered Jerseys and Herefords. He

Grows Up To Fight



3 weeks' supplemental when this picture was

A. D. Griggs with 8 of his Poland China and Hampshire brood sows in spring of 1943. He sold $4,000 worth of hogs and pigs in 1942, expected his sows to farrow 200 pigs in 1943.

brought the first Herefords to Anson County in 1911, from Kentucky, and gradually worked out of grade cattle into registered stock. He started with Jerseys in 1928 and 1929 "to keep his labor busy," he says. Although he operates a large dairy, he's still partial to beef cattle.

Mr. Lockhart can't tell you offhand exactly how many cows he has, except that there are over 100 each of Jerseys and Herefords, but he knows them all by name, and their grandparents, too! He can give the age of every cow on his farm. "I've got enough Scotch in me to make me love a cow."

There are some 1,500 acres under fence on Mr. Lockhart's farm, including 250 acres of open pasture and 150 acres of improved pasture. He says he has come to the conclusion that it's not worthwhile to put money into pasture improvement until you can do a thorough job of it. As a part of the district program, his pasture acreage is gradually being improved by liming, fertilizing, and seeding, with special emphasis on development of bottomlands.

We haven't appreciated nature's gift of the branch bottoms for pasture," he says. "We've got a lot of eroded land in Anson County, but there is a lot of undeveloped land along branches that will make as good pasture land as can be found anywhere, with adequate moisture even during dry seasons. "If you make a home for clovers and grasses, they'll stay there."

More than 1,200 farmers are now carrying out complete conservation plans on their farms as a part of the Brown Creek Soil Conservation district program. A survey of 51 farms that have been carrying out conservation plans for 2 years or more showed that the number of cattle on these farms had increased from 214 to 648 head, or more than 200 percent. At the same time, hogs increased from 341 to 560, or 64 percent, and poultry from 3,460 to 9,369, or 170 percent.

These increases in farm products essential to the war program were brought about, the survey shows, by the development of improved pasture and increased production of hay, corn, small grain, and other feed crops, as a result of improved land use and increased soil fertility from systematic rotations.

Improved pasture on the 51 farms has been increased from 161 to 659 acres, or approximately 310 percent. Perennial crops to provide hay and supplemental grazing have been increased from a total of 6 acres before conservation plans were developed to more than 200 acres at the time the survey was made.

Although the corn acreage on the 51 farms was re-

duced from 1,195 to 955 acres, the average yield per acre was increased from 18.9 to 25.6 bushels and the total yield from 22,560 to 24,406 bushels—or nearly 2,000 more bushels of corn on 240 fewer acres.

Similarly, the cotton acreage was reduced from 937 to 869 acres, while yields per acre were increased from 283 to 400 pounds of lint, and total yields from 531 to 695 bales.

"We've just begun to farm well under this new set-up," declares W. Henry Liles, of Wadesboro, chairman of the board of supervisors. "Farmers have bought tractors, tillers, disk plows, grain drills, and mowing machines since the conservation program got under way, and they are going into the cow and hog business. This has been a great help in the present situation, when labor required for row-crop farming is scarce and when livestock products are needed in the war program."

Mr. Liles' own farm is a good illustration of the change that is taking place. Five years ago he bought 500 acres of eroded land and began at once setting up a conservation program. With 200 acres of open land, he had 80 acres in oats, wheat, and barley this year and sowed lespedeza on all of the grain. Although he is still growing a good deal of cotton, Mr. Liles is shifting to livestock and plans to develop a herd of beef cattle.

He began raising hogs in January 1940 with one bred sow. Last winter and spring, between Christmas and the middle of April, he marketed $1,700 worth of hogs and pigs, including 35 fattened for market, 10 breeders, and the rest sold as pigs. He sold three of the hogs, weighing 1,820 pounds, for $261.93. He recently paid $150 for a boar that won first prize at the Illinois Hampshire show last fall and will breed him on his eight registered sows.

A. D. Griggs, of Morven, route 2, has been increasing his livestock for several years. Three years ago he had six brood sows, which he has now increased to 20. He also has a Hereford bull, 12 Hereford cows, and 7 heifers. He started raising beef cattle and hogs to use the increased feed that he produced as a result of his conservation program, Griggs explains.

From the sale of hogs and pigs last year, he got an income of $4,000 and this year he sold $2,500 to $3,000 worth of hogs from Christmas to mid-April. He expects his sows to farrow 200 pigs this year.

Griggs bought his Hereford bull and 12 cows in October 1941. From 12 calves produced last spring, he sold 5 purebred bull calves this year at 1 year old for $200 each and kept the 7 heifers. In addition to his beef cattle, he has 3 Guernsey cows for home milk production.

Griggs has 375 acres of open land on his 525-acre farm and used to plant 250 acres of cotton. He has now reduced his cotton to 125 acres and plants 125 acres of grain. He uses vetch, oats, and barley for winter and spring grazing and cowpeas and soybeans for fall grazing. He has found that grain fields that are grazed until early spring produce about as much grain as they would if left ungrazed.

Griggs recalls that he began his conservation program as a result of a spring rain that nearly washed his farm away 4 years ago. More than 4 inches of rain fell in 2 hours, washing out crops, cutting gullies through his fields, damaging the farm to the extent of more than $2,000.

"It made me sick to see what had happened to my land," he says. "I didn't want to look at it, but finally I got on my horse and rode around over the farm. I had never seen anything like it and I decided that if a conservation program would prevent something like that from happening, I wanted all the conservation I could get. I told the boys in the district what I wanted and as soon as the crops were off the land, I began terracing my farm."

During the next 3 years, Griggs terraced his entire 375 acres of cropland, set up improved rotations, including small grain, summer and winter legumes, fenced his land to enable him to practice rotation grazing, and planted 3 acres of eroded land to kudzu. Two acres of the kudzu last year furnished 175 cow-days of grazing. He is developing a 20-acre permanent pasture by fertilizing and seeding to bluegrass, redtop, orchard grass, lespedeza, and white Dutch clover.

The conservation program has cut down the labor requirements on his farm and he has been able to reduce the number of workstock from 25 mules to 12 by adding a tractor to his equipment. With the terracing, fencing, rotations, and other conservation practices now established, he estimates the farm is worth at least a third more than it was when he began conservation.

In contrast to the larger farms of Liles and Griggs, W. A. Ingram of Lilesville has only 44.5 acres in his farm, and he has to make every acre count. The district program has helped him to do this through improved rotations and better land use.

On 38 acres of open land, he is carrying out a rotation of cotton, corn, wheat, oats, and lespedeza. He has 5 acres in sericea lespedeza and 3 acres in kudzu in a natural draw, which serves as an outlet for terraces on his cropland. An electric fence enables him to use the kudzu for temporary grazing to supplement the 2 acres of permanent pasture on his farm. He uses soybeans, small grain and winter legumes for additional supplemental grazing.

With more hay and grazing crops and increased

ombining wheat on farm of A. D. Griggs, Morven, N. C.

ld in contour strip rotation of cotton, corn, wheat, and lespedeza on farm of W. A. Ingram, Lilesville, N. C.

ary Liles, chairman of the board of supervisors, takes a k at the barley in a 40-acre field on his farm near Wadesboro.

lds of grain, as a result of improved rotations, gram has been able to increase his cows from 1 to and his brood sows from 1 to 3. His wife likes look after the cows, and a good little income has en developed from the sale of dairy products.

They sell 12 pounds of butter a week at 40 cents a und, or $4.80, and 15 gallons of buttermilk at 25 nts a gallon or $3.75, making a weekly income of 55 from milk products. In addition they sell out three calves a year, kill one or two for themves. Last year Mr. Ingram sold 10 pigs at $7.50 ch and this year they expected to sell 30 pigs at) each.

"We used to have to borrow money every spring to run the farm," Ingram notes. "Now, the milk and butter take care of everything but the fertilizer and the manure has cut down 25 to 30 percent on that."

In the sandhill section of Richmond County, crotalaria is performing near miracles by increasing crop yields through the addition of large amounts of organic matter and nitrogen to the sandy soil. The 128-acre farm of A. T. Hutchinson, Rockingham, route 3, offers a good example of this. When he bought the farm 7 years ago it was generally considered one of the poorest in that section.

Shortly after he moved there, Hutchinson lent his planter to W. B. Little, representative of the Soil Conservation Service, for a crotalaria planting demonstration in the neighborhood. Hutchinson got started growing crotalaria with a few seed that were left in the planter. He planted these in a small seed patch and produced 70 pounds of seed. He increased these to 2,500 pounds the next year and sold $230 worth of seed. All his land has been planted to crotalaria.

Last year Hutchinson made $1,570 from 3.8 acres of tobacco that had been in crotalaria 2 years before. From 2.7 acres of peanuts he harvested 2,800 pounds of nuts and 2,400 pounds of peanut hay, and he planted 10 acres of this important war crop this year. Corn yields on the farm have been increased from 10 to 30 bushels per acre.

When Hutchinson moved to the farm in 1936, after having lost two other farms he owned during the depression, the only livestock he had was one plug mule. He bought the farm from the Federal Land Bank on a 20-year-payment contract and the Farm Security Administration financed his operations the first 2 years. He has a complete conservation program, developed with assistance of the Brown Creek district.

As a part of his conservation program, Hutchinson has established 3 acres of improved pasture and has 10 acres in the process of improvement. He has 5 acres of kudzu for supplemental grazing and hay, and plants 6 acres of rye for annual grazing. He has 14 acres of cropland in a contour strip rotation of corn, small grain, cotton, small grain.

The improved pasture and grain and hay crops which he is producing have enabled this farmer to increase his livestock by adding 5 cows, 2 brood mares, and 4 hogs. Last year he raised 2 colts and 2 calves. He sold 7 pigs and hogs and killed 4 hogs for home use. He also has 65 blood-tested Hampshire Red laying hens.

"I figure this farm will produce twice as much as it would when I moved here," Hutchinson says.

Instead of taking 20 years to pay for the farm, he completed his payments last year, at the end of 6 years. He has also paid $1,000 on one of the other farms he lost, which he is buying back.

Tebe Shepherd, tenant on the farm of Dr. F. B. Garrett, near Rockingham, says he helped a former tenant harvest in two tow sacks all the corn produced in a 6-acre field. By using crotalaria for soil improvement, Tebe says he increased the yield on the same field to 27.4 bushels per acre. The land has been in wheat for the last 3 years and in 1942 he produced 125 bushels of wheat on the 6 acres.

The first year he came there, Tebe says, he put 20 acres in cotton and produced two bales weighing less than 500 pounds apiece. In 1942, he reports that he produced five good bales, weighing a total of 2,788 pounds, on 7.2 acres that had been in crotalaria.

The farm wasn't producing enough feed for 1 cow when he moved there, Tebe says, and he needed at least 2 cows to furnish milk for his 6 children. As a part of his district conservation program, he has developed 8 acres of pasture, including a combination stock and fish pond. He has 2 young cows and plans to increase his herd as rapidly as he can raise calves. He also has 2 small brood sows and sold 20 pigs last year for $215 and raised 3 for home use.

Lespedeza has been just as important on H. B. Andrews' farm near Mount Gilead as crotalaria has been in the sandhill section. Until 6 years ago there had never been a lespedeza seed on his farm. Andrews says that now he doesn't use anything but lespedeza for hay. Of 600 acres of open land, he has 150 acres in lespedeza each year. He cuts hay off the lowland areas, but doesn't take anything except seed off the hill land.

Under the district conservation plan he has taken 75 acres out of row crops and put in hay, pasture, and trees. He has reduced his corn by 50 acres and increased his small grain for feed. He has boosted his corn yield from 10 bushels to 25 per acre, and cotton from an average of 300 pounds to 450 per acre. In 1942, with a cotton allotment of 111.5 acres he made 107 bales. The conservation program has enabled Andrews to cut down on his labor and reduce the number of mules from 20 to 15.

"We used to buy 10 bags of hog feed a week and bought corn for the mules. Now we have feed for sale," he says. "Every family on the farm but two has a cow, and we have increased the number of hogs from 15 to 30. Last fall we made 1,200 gallons of molasses.

"Six years ago, the farm was about to wash away and I didn't know what to do about it. The hill land was just about gone. Now I don't worry about it any more and farming has become a pleasu instead of a drudgery."

Over in Union County, the farm of V. V. Secre presents an outstanding example of the value conservation farming. Secrest worked out his con servation plan with the assistance of the old CC camp in that area and is continuing it under t district program. He was elected as one of the fi supervisors when the district was organized a has served in that capacity ever since.

When he bought the farm his neighbors told hi that it would "take a barrel of liquor and a bra band to raise a fuss on it," Secrest recalls, but a parently they hadn't taken into consideration wh good land use, terraces, summer and winter cov crops, and systematic rotations could do to the so in a few years. Land that produced only 3 bushe of wheat to the acre and took 5 acres to grow a ba of cotton, is now producing 50 bushels of corn, to 35 bushels of wheat, and 50 to 75 bushels of oat

It was the transformation that occurred on t Secrest farm that made Tom Broome, the dean county agents of North Carolina, begin to wond whether there actually was any such thing as su marginal land. He thinks that a lot of land that considered "submarginal" can be brought back productivity if it is put to the proper use and bui up through sound farming practices. And tha he says, is vitally important as a part of the w program.

"Increased production has got to come throug increased fertility," Broome declares. "I have se out a letter to every farmer in Union County askin them not to have an idle acre on their farm—to p it all in food, feed, and grazing crops so as to hel win this war as soon as possible."

COMMITTEE ON SEED PRODUCTION

(*Continued from page 147*)

sound policy can be put forward calls for a deal thinking, work, and coordination.

The War Food Administration has long felt t need for a central source of data on the various que tions on grass and legume seed—a means of marsha ling every pertinent bit of information existing in t Department. Accordingly, J. B. Hutson, direct of the Food Production Administration, has a pointed a committee of representatives from the se eral interested branches in the Department, to form late recommendations dealing with seed progra

In appointing the Committee on Seed Producti Programs, Mr. Hutson stated, "The providing

adequate supplies of grass and legume seeds is one of the most difficult and important food production problems. This is especially true in connection with the maintenance of a high level of production over a period of years. Recently several suggestions have been made for strengthening this phase of our program and some changes have been made in existing programs to give added encouragement to seed production. It is probable that a concerted attack on the problem by all of the agencies concerned will disclose that additional measures can be adopted to advantage."

To obtain sound advice on such problems, Mr. Hutson has appointed a continuing committee with C. R. Enlow of the Soil Conservation Service as chairman. Other members are—

Joseph F. Cox, Production Programs Branch.

W. A. Davidson, Food Distribution Administration.

G. C. Edler, Bureau of Agricultural Economics.

O. S. Fisher, Extension Service.

M. A. Hein, Plant Industry, Soils, and Agricultural Engineering.

E. A. Hollowell, Plant Industry, Soils, and Agricultural Engineering.

M. M. Hoover, Soil Conservation Service.

E. A. Johnson, Production Programs Branch.

O. D. Klein, Agricultural Adjustment Agency.

C. J. McCormick, Commodity Credit Corporation.

W. A. Wheeler, Food Distribution Administration.

Mr. Hutson went further. He presented four problems of immediate importance, concerning which he wants the committee to develop recommendations:

1. Development of a comprehensive program for adequate seed production, including the increase of foundation stocks of high producing, adapted varieties.

2. Review of support and ceiling price programs as they affect seed production and utilization.

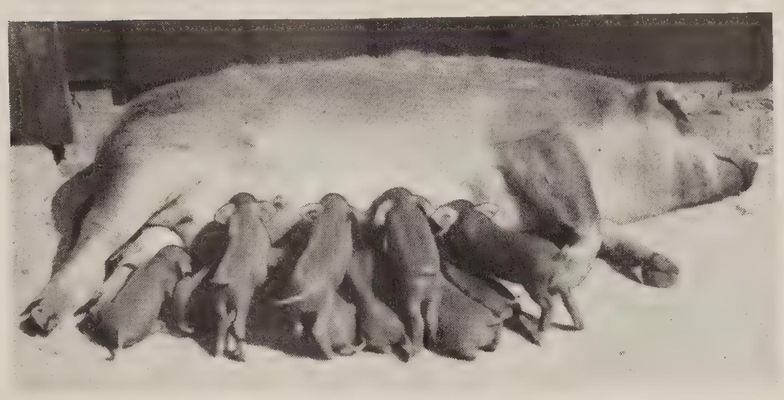
3. Technical assistance and recommendation of policy regarding the importation of seeds and the utilization of available supplies.

4. Obtaining reliable statistical data for use in establishing production goals.

Needless to say, there will be many more problems assigned to the committee for handling and Mr. Enlow has his work cut out to coordinate the recommendations of the different agencies and men represented on the committee. This is a real step forward in placing the value of conservation in the food production program of the nation in its important place. We will be looking for better planning and action in the solution of our future grass and legume seed problems.

PENAL FARM REBUILDS LIVES AND SOIL

(*Continued from page 155*)



Feeding time at the Duroc farrowing barn.

vides warmth for newly farrowed pigs. The farrowing barns, because of the mass production schedule on which they operate, are known as "Willow Run." During the previous week, Ellis told us, an average of 100 pigs a day were farrowed there.

When a litter is 3 or 4 weeks old, the sow and her pigs are transferred to one of a series of 60 outside runs, constructed on a steep hillside, to provide good drainage. These runs are kept planted to some grazing crop to provide green feed. The sow and her pigs are kept in these individual runs until the pigs are big enough to wean, when they are turned out on pasture with the other hogs.

"We are trying to make the hog a sanitary animal," Ellis tells visitors as they marvel at the cleanliness.

The jobs the prisoners do all represent productive work, the results of which they can see in the food they eat, the clothes they wear, and in virtually every other article they use in their daily lives, for the farm is almost entirely self-supporting. It makes its own ice, and operates its own laundry, maintains its own cold storage, slaughter, and dehydrating plants. Furniture is made in the woodworking shop from timber harvested in the 700 acres of woodland and processed in the farm's own sawmill. Women prisoners do the laundry, make the clothes which they and the other prisoners wear.

Among the shops on the perimeter of the central group of buildings is the repair shop used for repair of all county owned equipment—road machinery, farming implements, cars and trucks of the county health department, sheriff's office, and other departments of the county government. The penal farm also provides the labor for county roads. Metal bodies for the big trucks used to transport work crews to jobs on the roads or distant part of the farm are built by the prisoners. These trucks have specially built-in compartments for food, water, and tools, en-

abling the crews to remain on the job throughout the day. Many farm implements, such as wooden drag harrows and stalk cutters made from worn-out blades of road-grading machinery, are also produced in the shops.

Just as the farm itself typifies the agricultural phases of rural life, so does the central group of buildings present a small-scale model of an up-to-date urban community, drawing its sustenance from the surrounding farm land. In this combination of rural and urban activities, the prisoners have an opportunity to bring to clearer focus the complex relationships of human society. Where the job of every man and woman can be seen as an essential part of the community life, that job takes on added significance. When a prisoner begins to take pride in his own skill in doing a job at which he is proficient, the groundwork has been laid for his becoming a useful member of society.

"I wouldn't try to give you the idea that everything is rosy here," Ellis said as he took us through the various buildings where the prisoners were at work. "We have a lot of men who are tough when they come here and tough when they leave. But I don't say even they are hopeless. Maybe they are just cases where we fell down on the job. We have a lot of others who find themselves and get a new conception of their relationship to society while they're serving their time here.

"There's a boy right over there," he said as we entered the machine shop, "who could go out as a finished welder right now and make a hundred dollars a week. When he came here he had had no education or vocational training and had just drifted from one thing to another. Now he has mastered a trade and takes a pride in his work.

"The best prisoner we ever had," Ellis continued, "was a boy who was sent out here to serve a 10-year sentence for highway robbery. He was sour on the world, thought everybody was against him, and was out to get what he could, regardless of how he got it. Now his whole attitude has changed. He has become a first-class mechanic and is grateful for the training he's received. He has until August of next year before he'll be eligible for a parole, but I'd recommend him right now for any kind of mechanical job anywhere."

As you go with Ellis among the blue-denim clad prisoners inside and outside the spotlessly clean buildings and through the equally well-kept grounds, as you hear the prisoners talk to him like respectful employees, rather than prison inmates, as you hear him discuss farming operations, terracing, pasture development, truck gardens, cattle, hogs, silos, and barns, you begin to lose sight of the penal side of t institution and begin to realize more and more th you are seeing a very remarkable example of t operation of a highly efficient farm.

The whole undertaking, with its emphasis on r- habilitation of prisoners and conservation of la evident in almost every activity, might be conside a most unusual experiment, except for the fact th the institution last year showed a net operating pro of $100,000. An enterprise that operates on that ki of basis ordinarily is not classified as an experime

The average cost of operating all penal and el- mosynary institutions in the United States last ye was $1.29 per person per day, Ellis points out. t that rate, the annual cost of operating Shelby Cou Penal Farm, with a present average of 500 prisone would be $240,000. Instead, an audit of the pe farm's books for the fiscal year ended August 31, 19 showed a gross revenue of a quarter of a million d- lars, an a net profit of $99,949.29.

In dealing with the crime of erosion, officials at t farm have recognized that the culprit is not the la itself, but the water that runs off sloping land a carries away fertile soil and plant food. Putti every acre to work at its proper job, therefore, wi not alone solve the problem. The run-off water st has to be controlled and directed into useful chann This has been accomplished here in a most ingeni manner by diverting surplus water from slopi fields into a series of nine ponds, connected by lar diversion ditch 2.5 miles long. Water is stored these ponds for irrigating truck crops during d weather and for stock water in the upland pastu

Before this water disposal system was develop the runoff water from the hill lands poured do over the lower-lying areas, including 100 acres land now used for growing vegetables and tru crops, and washed out gullies with every heavy long continued rain. It also kept several hund acres of bottom land too wet for cultivation. The fi step toward control was to construct broad, chann- type terraces at intervals down the slope to trap runoff from the area immediately above and div it slowly out of the field. This series of terra emptied into vegetated outlets through which water was conducted into the series of ponds wh it could be stored and utilized as needed.

The ponds provide a reservoir for all the wa draining from 550 acres of land lying above. Wa that is stored in one of the ponds during the win months, which is the period of heaviest rainfall released as needed to irrigate the 100 acres of tru crops below during the late summer and fall, wh droughts frequently occur. This pond has a ma-

a capacity of 113 acre-feet, or 37,000,000 gallons, and when full covers an area of 11 acres.

While this water disposal system, designed to take care of the surplus runoff water from the upland fields, is a fundamental part of the soil conservation program on the farm, a big part of the job also is done by pasture grasses that retard the flow of runoff water, protect the surface soil from erosion, and increase absorption of water by the soil. Absorption is further encouraged by subsoiling the pastures each fall with a chisel-like plow which opens up narrow slits in the soil to a depth of 18 inches, permitting the rainfall to soak deep into the group where it provides moisture for plant growth.

Erosion thus has been almost completely controlled by keeping the sloping land under a continuous cover of pasture sod or close-growing crops, using only the level or moderately sloping land for production of row crops, and combining this sound land use program with a complete water disposal system that controls and puts to productive use the surplus runoff water.

You get the idea in talking with Ellis that they don't accept the traditional methods of doing things on Shelby County Penal Farm. Here in the heart of the land of cotton is a 4,600-acre farm without a stalk of cotton on it. In a section where developing a pasture has traditionally consisted of putting a fence around an area of worn-out cotton land and turning in the work stock and a few scrub cows, is one of the finest Jersey herds in the world, grazing on pastures developed in accordance with the best experiment station recommendations.

Even the windmills with their blades spinning merrily in a lazy Indian summer breeze, presented a contradiction to the generally held belief that windmills won't work in that section of the country. Two windmills furnish water for cattle on all the lowland pastures and Ellis says that 36 hours is the longest period that occurs without sufficient breeze to keep the blades turning. With adequate storage capacity, plenty of water is available at all times.

In a region where huge levees parallel to the streams are the traditional method of protecting fertile delta lands from the fury of Ol' Man River, dikes have been constructed at right angles to Wolf River at intervals of a mile apart. These prevent the swift current from scouring off the topsoil during floods, but permit the water to overflow the bottomland and deposit fertile sediment in the ponded areas between the dikes. Floods usually come in March or earlier and rarely occur when summer crops are on the land, Ellis says.

Most of the bottomland used to be considered worthless, because it stayed too wet to cultivate and it had been allowed to grow up in willows and other scrub growth such as still covers similar land adjoining the penal farm. The willows and other trees were cleared out, a system of drainage ditches installed, and it is on this bottomland that most of the farm's row crops are grown—1,000 acres of corn, and 250 acres of sorghum, corn, and beans planted together for silage. This year the land made 60 bushels of hybrid corn to the acre and Ellis says he expects eventually to get the yield up to 100 bushels. As soon as the summer crops are harvested, the land is planted to oats and vetch for winter grazing and soil improvement.

In contrast to the bottomland areas, where the land is plowed and planted to corn, sorghum, and soybeans year after year, in rotation with small grain and winter legumes, a thousand acres of rolling land is kept in permanent pasture sod that protects the soil of these slopes against erosion. Another 500 acres of lower lying and moderately sloping land is in rotation pastures, which are plowed and planted to crops every few years and then reseeded to pasture grasses and legumes.

"We think we've got to study the personality of the land, just as we study the personality of the man," is the way Ellis sums up the conservation of human and soil resources on the Shelby County Penal Farm.

THE SOIL AND IZAAK WALTON

The relation between stream pollution control and soil conservation was graphically emphasized recently by Len Hofmann, president of the Indiana division of the Izaak Walton League of America, in an address before the Garden Clubs of America, November 10, New York City. Mr. Hofmann called for a five-point program "to make our waterways flow clear and pure once again." Conservation agencies, civic groups and service clubs were challenged to "direct cooperation with agricultural groups, urging and assisting in the formation of soil conservation districts to begin the necessary work of watershed control at the headwaters of our silted waterways." Other points in the proposed program revolved about an educational effort directed at the elimination of all types of stream pollution, legislation permitting States or a specially created agency to acquire rights-of-way for management of stream banks, local action to force adequate disposal of industrial wastes and municipal sewage, and the requirement that a municipality's eligibility for Federal funds in any post-war public works program be contingent upon construction of pollution control facilities.

MUTUAL DRAINAGE ASSOCIATION SPEEDS FOOD PRODUCTION

By EDWIN FREYBURGER

THE MUTUAL drainage association is proving to be a quick and effective solution to many drainage problems in some parts of the upper Mississippi valley region. Indiana has had particularly good success with this type of organization.

Informality of the mutual drainage association permits speedy action in getting land drained and in full production. It is especially desirable now as a means of boosting the yield of food for victory. An example of rapid results in drainage is provided by a group of farmers in Knox County, Ind., who organized an association last December and had ditch cleanout completed in time for a 1943 crop.

Legal procedure involving long delays and often legal costs of practically the same amount for a ditch cleanout as for the original construction has caused dissatisfaction in some states with legally established drainage districts. This dissatisfaction has led groups of farmers to organize mutual drainage associations whereby they could have their drainage facilities rehabilitated more quickly and with less expense.

Obviously, the successful operation of a mutual drainage association depends upon full understanding and agreement among all landowners as to what is to be done and as to cost. A mutual organization can operate only on this basis because there are no laws, such as are provided in the organization and operation of legal drainage districts, to force an individual or minority group to grant right-of-way and stand a share of the cost of improvement.

The mutual drainage association best meets the requirements of a few landowners who have no petty differences and who are willing to cooperate for the common good. Three to 12 constitute a desirable group. Larger numbers have been brought together, however, as in the case of the Roberson ditch near Wheatland, Ind., within the Knox County Soil Conservation District.

The Roberson ditch was last dredged as a court ditch during the summer of 1931 at a total cost of $15,933, including legal fees, engineers' costs, and other charges. Early in 1941 a meeting was arranged by interested landowners of the soil conservation district, to promote better agricultural conditions through a combination of erosion control and drainage. This meeting was led by the county agricultural agent, H. S. Benson, and was attended by a member of the soil conservation district technical staff. It resulted in preparation of an application for a survey of the Roberson ditch for owners of land abutting on it. When the soil conservation district supervisors received this application, they started a soil conservation survey which formed the basis for a land capability map of the area.

Thirteen landowners who met in December 194[?] to discuss the capability map, preliminary survey data and effects of erosion on drainage improvements formed a mutual drainage association and requested assistance from the soil conservation district in clearing lines so that an engineering survey could be completed. This request was granted and labor was supplied through the association.

On February 12, 1943, a second meeting was held with 20 landowners present, including representatives of a railroad and of the county highway supervisor. Complete plans and general specifications for ditch improvements were discussed, and a preliminary assessment roll was made on a total estimated cost of $8,500. A week later, another meeting listened to final specifications and plans, and adjustments of the assessment roll affecting 27 landowners, the Knox County Highway Department, Indiana State Highway Department, a coal company and a railroad. At this meeting the secretary-treasurer received over $2,000 in checks and cash. Arrangements were made to contact interested contractors and to collect money during the next 3 weeks. On March 17, 1943, a contract was let for moving 6,50[?] cubic yards of earth at a cost of $6,850. It was necessary for the contractor to do some clearing of right-of-way, for which he was to receive $95[?] additional, making a total cost of $7,800, about one-half the cost of the 1931 cleanout. In connection with the ditch rehabilitation, farm plans for erosion control were completed for 31 farms involving 4,085 acres adjacent to the ditch.

Work was begun March 24, 1943. Unusual weather conditions somewhat delayed the work but indications are that landowners will receive benefits this first year which will more than pay the entire cost of the cleanout.

The Roberson job is a fairly typical example of the procedure followed in organizing a mutual drainage association in this region.

Organization of a mutual drainage association may require several meetings. It is initiated by a written or verbal application for assistance from interested landowners. Application is made to the so[il]

EDITOR'S NOTE.—The author is chief, regional engineering division, Soil Conservation Service, Milwaukee, Wis.

Tw miles from mouth of Roberson ditch, looking upstream toward county road. This section is 10½ feet deep, 6 feet wide at ottom, 48 feet across top. The picture was made 1 month after excavation. Note distance of spoil from edge of bank.

co ervation district governing body. If action ap ears desirable, the governing body may first ap oint a committee to make an investigation and re ort back, or may immediately hold a meeting of in rested landowners. If an initial meeting is held, al interested and affected landowners and tenants sh uld be invited.

he first meeting should be opened by a district su ervisor, a county agent, or a community leader as emporary chairman. If there is a county en- gi eer, he should be there, and a Soil Conservation S vice employee also should be present. A general di ussion of the drainage problem will determine if here is sufficient interest to justify a preliminary o detailed survey, and will also bring out those p blems that are particularly troublesome. If, in th opinion of the district governing body, there is s icient interest and urgency, Soil Conservation S vice personnel will discuss steps necessary to cor- r t the drainage problem.

he conversation will embrace what other groups h e done about similar problems, the assistance a ilable through the soil conservation district, the a antages of an association, and the way a mutual d inage association is formed. An association may a ually be formed at this time, or that step may be p stponed to a later meeting. In order to obtain m re detailed information for a subsequent confer- e e, the district governing body should request land- ners involved to grant ingress and egress to their operties by signing a formal request for a prelimi- ry survey and estimate.

When preliminary plans and estimates have been mpleted another meeting is held. Progress to date outlined by the chairman. If the preliminary rvey and estimates are received favorably, the ual procedure is to form an association, if this yet remains to be done, to elect officers, and to draw up the articles of association.

The raising of money to defray the cost of work must then be decided. Various methods are employed, namely: (1) Voluntary contributions without regard to acreage or benefits. The success of this method depends on how urgently the tentative cooperators want the work done. (2) Equitable collections on the basis of old assessment rolls on court ditches. (3) Charges adjusted to benefits based on land capabalities. (4) Cost-sharing according to flat acreage.

Arrangements are made to notify everyone interested, by letter or in person, of the contribution required. Arrangements are made for some bank to hold the money in escrow. Experience has shown that actual construction should not be started until the money has been raised. A definite understanding should be reached relative to the authority of elected officers to accept bids, award contracts, and use association funds.

Following this method a detailed survey and estimate is made by technical representatives of the soil conservation district. When the detailed survey and estimates have been completed, it is presented to the officers of the association, who prepare a letter to all landowners affected, setting forth the details of the contemplated work, the cost to each, how and where the contribution is to be paid, and other pertinent information. If there are objections on the part of landowners regarding contributions, location, or details of design, an effort should be made to effect necessary adjustments.

The fixing of contributions is to be handled entirely by officers of the association. It is important that such officers maintain a complete record of contributions, showing acres of land assessed, legal

description of tract, amount of assessment, date of payment, and how made (whether cash, check, or otherwise). Rights-of-way should be recorded as a part of the record.

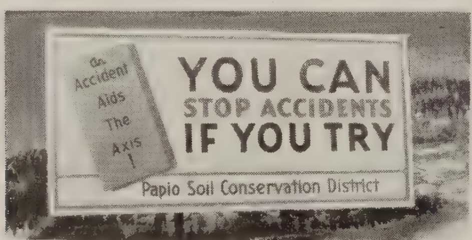
After the money has been raised and deposited in escrow, the preparation of a working agreement between the mutual drainage association and the soil conservation district is undertaken. Specifications and bid proposals are prepared and prospective contractors invited to bid on the job. Contract is awarded by association officers to the lowest reputable bidder. It will be necessary to call a third meeting of the association, if the authority to award contract was not delegated to the association officers. The job is then staked by technical representatives of the soil conservation district and the contractor goes to work.

If a Government dragline is furnished to the soil conservation district, there will be no bidding or letting of contract. Payment in such case is made by the drainage association to the soil conservation district on a yardage or hourly basis, as set up by the district governing body.

While mutual drainage associations are organized to take care of immediate drainage needs, consideration should be given to making them permanent organizations because they can be used to good advantage to provide periodic maintenance to drainage systems.

Because of the variance in State and local conditions, the general procedure for the formation of mutual drainage associations must be adapted to each case. Justification for mutual drainage associations will depend upon the flexibility of State laws and the desire for mutual cooperation among farmers.

On the grain lands of the Pacific Northwest and of the Great Plains stubble mulch farming has found wide acceptance. Few recent agricultural innovations have traveled so far or so fast. Crop residues used as stubble mulch are effectively fighting wind damage on hundreds of thousands of acres in the "blow" States, and at the same time are conserving moisture, improving soil structure, and checking run-off. The practice is solidly established in the West as a standard soil-management measure.



The supervisors of the Papio Soil Conservation District, which includes Washington County, Nebr., believe that conserving human resources is as much a part of conservation farming as the conservation of soil and moisture.

Acting on that belief, and in view of the numerous serious accidents which have happened in the county, the supervisors erected the 10- by 24-foot signboard shown here.

The sign was erected on the highway over which the largest number of farmers travel on the way to Blair, the county seat. It is planned to change the wording in the panel on the left every 6 weeks or so.

Since this picture was taken, the supervisors have placed an 8-inch strip lettered "Buy War Bonds and Stamps" above the sign.

The Papio Soil Conservation District was the first to be organized in Nebraska, the referendum being held in February 1938. Its original area was 48,000 acres on the Papio Creek drainage, but it has since grown to include all the county. It is on the extreme eastern edge of Nebraska, a short distance north of Omaha.

WALNUT FOR GUNSTOCKS

(*Continued from page 151*)

The production of walnut logs from the farm forestry project in 1943 was more than 140 carloads for gunstock material, with the logs having been harvested in a manner that will assure still more walnut in the future. Indications are that production will continue at a good rate.

The Nebraska farm forestry project is doing much in the war by bringing buyer and seller together to the mutual advantage of both, saving manpower by getting walnut to market so that gunstocks can be made, and helping to safeguard the supply for future years.

SUPPLEMENTARY GLEANINGS FROM THE FIELD OF HYDROLOGY

By Clarence S. Jarvis. 90 pages; 21 figures; 14 tables

Privately printed and available in a limited edition, this data-packed handbook for hydrologic technicians marks the culmination of many years of investigations by the author, a distinguished engineer-scientist formerly of the staff of the Soil Conservation Service. It is an assembly of basic and background or related data on which was developed the methodology employed in recent technical papers published mainly in the "Transactions of the American Society of Civil Engineers" and "Transactions of the American Geophysical Union."

It is reported that the methodology used by Dr. Jarvis has been put to practical test in defining the runoff characteristics of river systems within prospective invasion areas overseas.

For REFERENCE

Compiled by ETTA G. ROGERS, Publications Unit

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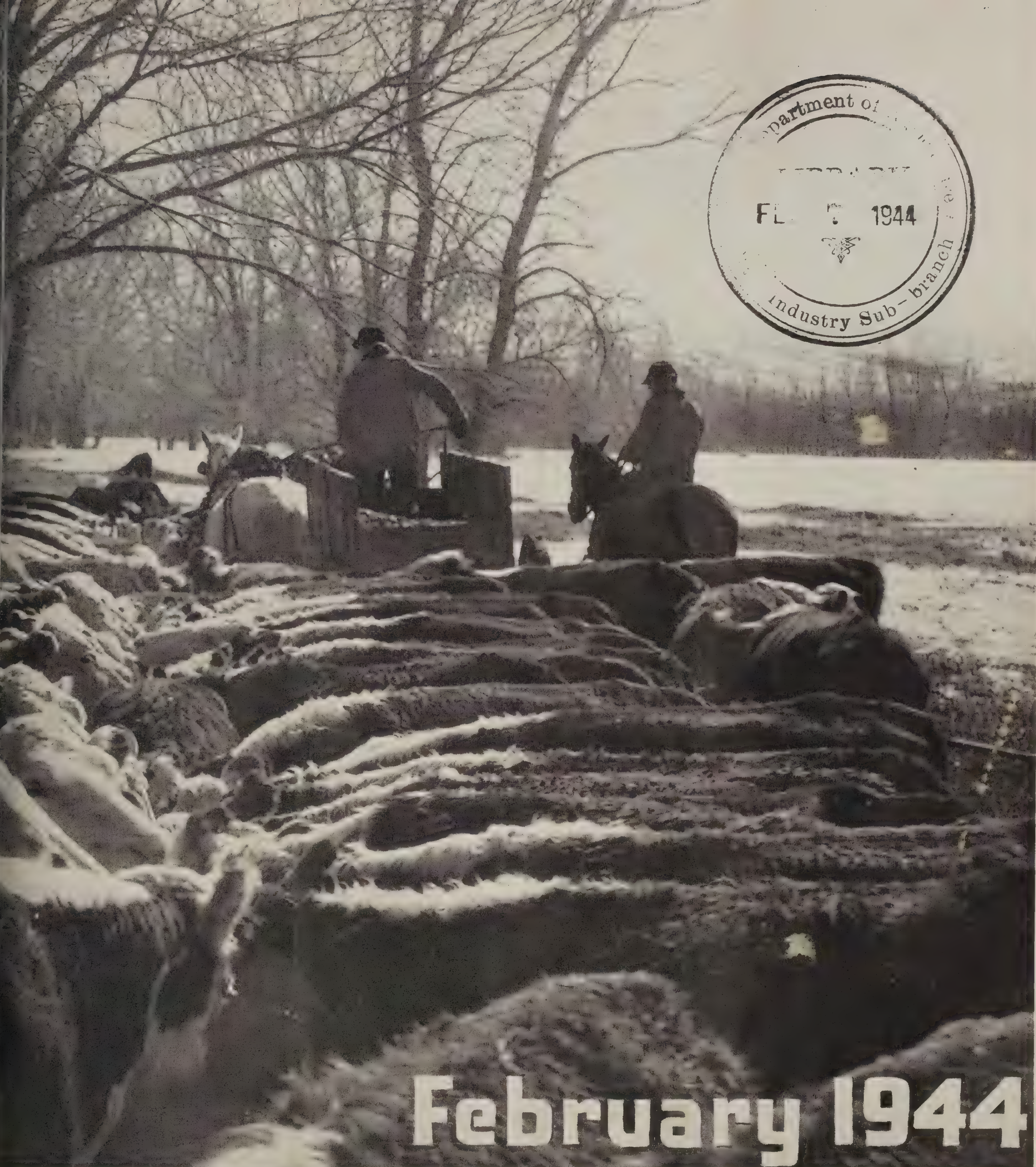
Winter scene on the farm of Albert Holm, Spring Grove, Minn. From these white oak logs will come sturdy posts for a fence protecting the woodlot. There's no gap in the calendar of soil conservation activity. (Photo by G. V. Gideon of the Soil Conservation Service.)

U. S. GOVERNMENT PRINTING OFFICE: 1943



February 1944

SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

TED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

Contents

WELLINGTON BRINK
EDITOR

Soil Conservation is issued monthly by Soil Conservation Service of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. Soil Conservation seeks to supply to workers of the Department of Agriculture engaged in soil conservation activities, information of special help to them in the performance of their duties. Copies may also be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., 10 cents a copy, or by subscription at the rate of $1.00 per year, domestic; $1.50 per year, foreign. Postage stamps will not be accepted in payment.

Harvesting kudzu with a combination mower and chopping machine on Cason Callaway's farm near Hamilton, Ga. Mr. Callaway's plans call for the dehydration of kudzu from more than 700 acres, sericea lespedeza from 450 acres, crimson clover from 250 acres, other legumes from more than 100 acres, in 1944.

KUDZU—Power Plant of South's New Agriculture

By H. H. BENNETT

Within the past ten years the agriculture of the South has taken a long forward step toward conservation, diversification, and other basic changes for general betterment. Scientific land use practices are being substituted for older methods that were allowing rapid and deadly wastage of productive land.

This new agriculture has not yet gone nearly far enough. It has made sufficient progress, however, to get into the understanding of the people—into their blood stream. Moreover, it is piling up results sufficiently convincing to assure that there will be no turning back, no wavering, no quitting.

The changes that have spread over the land are about as great as was the original change from forest to farming. Travelers by air discuss it as something on the order of a miracle. And that's about what it is.

These changes fit effectively into the Nation's vast wartime needs for increased products of the soil.

And they are resulting in greatly increased production of crops of all kinds. Hundreds of representative farmers from all over the South—little farmers and big farmers—have reported their increase in yields resulting from adoption of conservation farming. For example, 1,829 such farmers—I mean representative farmers, tenants and owners, little farmers and big farmers—have recently reported results obtained on their own farms by working with soil conservation districts for 2 years or more. **These results of conservation farming have been an increased production of the five major regional crops ranging from 14 to 110 percent; increased production per acre ranging from 19 to 42 percent; increased area of improved pasture, 215 percent; increased number of cattle, 82 percent. The increased production of corn amounted to 178,000 bushels more than on 15,000 fewer acres; and 1,719 more bales of cotton were produced on 9,435 fewer acres.**

Recently there has been a shortage of grass and legume seed. This came about partly because of the tremendous expansion in the acreage of such crops as peanuts and soybeans, which tended to reduce the harvest of seed crops. At the same time there was an increase in dairying and meat animals and increased need for legumes as a source of nitrogen.

Recognizing increased local production of seed as fundamental to any considerable move for more grasses and legumes, the Soil Conservation Service has carried on an intensive campaign to get farmers to harvest seed. Many soil-conservation districts have launched seed-production drives, with outstanding success. The Holmes County, Miss., Soil Conservation District, for example, collected 1,623,020 pounds of seed of 15 grasses and legumes in 1942. Five years ago not one pound of seed of these same grasses and legumes was collected in that county.

Editor's Note.—The author is Chief, Soil Conservation Service, Washington, D. C.

Along a Georgia roadside kudzu's magic effect is seen in these before and after photographs.

This same kind of thing is going on in Georgia and in the other Southern States. The districts are doing a valiant service in pushing the pasture and seed-collection phase of their conservation work.

Here's another example of some of the profound changes, all of which are giving increased production. At the beginning of 1943 there were in the Bogue Chitto-Pearl River Soil Conservation District in Louisiana, east of the Mississippi River, something over 200 new pastures which farmers had been able to establish through the joint activities of the Soil Conservation Service, the district, and other local agencies. Plantings for 400 new pastures are now being completed, making a total of 14,000 acres of some of the finest pastures in the United States—mixtures of clovers and grasses that pretty nearly supply year-around grazing, a lot of milk and a lot of good beef.

Thus, milk and butter, beef and manna have arrived on the banks of Bogue Chitto and the Pearl. Cotton—well, I saw one field, that of Mr. J. M. Lambert, near Kentwood, La., changed over to pasture last year, and it had been producing a bale and a half of cotton per acre. I asked him if he wasn't

arvesting a kudzu crop on the farm of Bona Allen, Gwinnett County, Ga. Three and a fourth tons of hay per acre came from this field

Corn makes an excellent yield on this kudzu-covered site on the farm of Baker Pinkston, Tallapoosa County, Ala.

Grazing kudzu is one of the profitable practices on the dairy farm of Asbury D. Wright, Hall County, Ga. This 3-year-old kudzu is growing on a portion of the farm which was worn out by row crops.

afraid it would get out that a farmer named Lambert, up in the Tangipahoa country, was plowing up a bale-and-a-half per-acre cotton field and planting it to grass and clover. He replied that he didn't mind at all—"tell 'em to come up and see what I'm doing."

I went back to Lambert's place this past spring, shortly after 18 cows were turned into this new pasture. They were producing 4 dollars' worth of milk more a day than before, which was enough to pay for the entire cost of the pasture development in 5 weeks.

And that's not all by any means. Other astonishing advances are changing the ways of southern agriculture. New crops of amazing capacity for good, and new methods for making soil more productive are spreading rapidly across the Southern landscape.

What, short of a miracle, can you call a plant that, with a little encouragement, takes in hand a piece of worn-out, abandoned land—so gullied you have to keep jumping to get across it—and in a little while converts it into excellent pasture for cattle, hogs, sheep, chickens, and work stock? That's what has forced us to revise our former appraisal of a lot of severely eroded land, as having been ruined for further agricultural use. Actually these gouged-out lands can't be plowed for row crops—but they are often excellent for pasture for the production of beef, milk, butter and pork, and for feed for work stock.

Moreover, the value of kudzu is not in any sense restricted just to severely eroded lands, critical slopes, and gullies. It is a splendid crop for good land, too. Not only can it be cut for hay on the smoother lands, but it protects these lands—all lands on which it is established—from erosion. It stores organic matter and nitrogen in the soil. It shades the land, keeping it cool and mellow and absorptive. It will run through and cover a cornfield this year; next spring or early summer it can be plowed, and the land planted to corn; then after the last cultivation of the corn it will again spread over the field, stop the erosion, store some more nitrogen and at the first hard frost lay down a carpet of rich leaf-litter at least the equal of a good ground cover of forest-litter. All this in one year. Many abused cornfields that were producing around 7 bushels of corn per acre have been improved and protected to the point where they are producing up to 40 bushels or more every year.

Kudzu within the last few years has spread from the status of an ornamental or grazing crop on a few widely scattered farms, to a 400,000-acre, high-grade hay and grazing crop. Estimating beef production at only 150 pounds per acre, this much kudzu would turn out, if used for beef cattle, 60 million pounds of beef annually. Looking ahead, I see the likelihood of 8 million acres in kudzu before very long.

There used to be a time, in the South, when people speculated on what marvels could be achieved if only the region had an alfalfa suited to the climate and soils—how such a crop would set the step for taking up livestock and dairying, the key to diversification and sound agriculture. Nowadays, the situation is somewhat reversed. I am being asked all through our Northern States if it is likely that a variety of kudzu will be found that will grow in the North! Many northern farmers are beginning to envy the South its advantage in having this new plant marvel, kudzu, to range alongside such other newcomers to fame as the lespedezas, crotalaria, wild winter pea, blue lupine, Dallis grass, and all the rest. And alfalfa is growing successfully, too, in many parts of the South.

All of these things are in the nature of permanent improvements to Southern agriculture. They are not likely to be cast off, or forgotten—ever.

Recently, in Atlanta, I participated in a meeting of the Kudzu Club of Georgia, a unique organization mentioned briefly in the November 1943 issue of *Soil Conservation*. This proved to be one of the most significant and far-reaching agricultural meetings in recent years. More than 300 persons were in attendance—county agents, experiment station directors, vocational agriculture teachers, extension directors, supervisors from 22 soil conservation districts, bankers, railroad representatives, judges, doctors, editors, legislators, master farmers, a utility company president, college officials, State and Federal workers. One interest they all had in common—kudzu, and the opportunity that kudzu offers the South.

The conference evolved into an "experience meeting." We were told by one of the group of a study he had made on the effect of kudzu on temperature; in the shade of this legume the ground stays cooler than it does in the shade of other vegetation tested.

Cason Callaway told of results he is getting from growing kudzu and selling it for hay. Later I visited the Callaway plantation on Pine Mountain, near Hamilton, Ga., to see for myself the splendid start that has been made toward utilizing all the land of an entire watershed in accordance with its adaptability and need. Here the impoverished cultivated lands are being built back to high productivity, and progress is being made to control floods and stop silting. Here, on the Callaway farm, is the most modern plant I know of anywhere for dehydrating kudzu, sericea, alfalfa, and other hay crops. Mr

Cllaway has a large acreage in kudzu, which he con-
vts into meal. An analysis of this meal—dehy-
dited leaves, stems, and vines—shows a protein con-
tt of 19 percent, and a carotene content of 285 micro-
gms per gram.

Dr. H. P. Stuckey, director of the Georgia agri-
ctural experiment station, had some interesting an-
ases to offer the conferees. Laboratory tests at his
stion showed kudzu leaf meal with protein contents
rging from 17 to 30 percent and with a carotene
ctent running up to better than 400 micrograms per
gam. That's powerfully good in the way of sub-
snce for the flesh—any kind of flesh.

Somebody suggested that the stuff — ground
kdzu—might be suitable for human consumption.
"ake out some of the fiber and maybe you'll have
smething on the order of a steak."

My friend Bill Pryor didn't take the remark as a
jke. He borrowed some of my supply and showed
u the next day with a batch of kudzu soup. Said
l had strained out the more fibrous material, added
alittle milk, a pinch of thyme, and a dash of onions,
a number of people said they "rather liked it." It
ld quite an "alfalfary" twang, everybody admitted,
lt maybe you could get used to that.

In my own talk at Atlanta, I asked this cross-sec-
tnal gathering to make a pledge to work for 8 million
res of kudzu in the South by 1950. To help guaran-
e such an attainment, I suggested that a kudzu so-
ety similar to Georgia's be established in each Southern State right away. Unanimous approval met this twin proposal.

Let's watch this movement grow!

Chopped kudzu is fed through this stationary chopper to be cut finer before entering the dehydration oven where it is dried at 1,400° Fahrenheit under steam pressure. Cason Callaway discusses the process with James A. Garrard, at left. Garrard is district conservationist, Pine Mountain Soil Conservation District.

GEORGIA BANKERS ACCLAIM TOPFLIGHT FARMERS

The Georgia Bankers' Association, convinced that con-
rvation farming is a sound community investment, set the
ice at a meeting in Rome, Ga., on November 4, for a
ries of 20 programs the association plans to sponsor in
e 20 soil conservation districts in the State. These pro-
ams will accord recognition to farmers who have made
itstanding progress in carrying out complete conservation.

The 18 banks, and the district cooperators, in the 8 coun-
es of the Coosa River soil conservation district joined in
aking the meeting a success. Said George L. Rice, presi-
ent of the Georgia Bankers' Association: "Nothing the
ssociation has attempted in the interest of Georgia agri-
ilture will pay a bigger dividend than the soil conservation
iovement, with every bank in Georgia squarely behind it."

The idea wasn't original in Georgia. It was lifted almost
itact from a plan developed in Oklahoma, even to the word-
ig of the certificates presented to farmers. But once the
lea was adopted, the Georgia bankers began to put it across
i their own inimitable fashion.

The Coosa River District up in the northwest corner of
he state looked like an ideal place to begin. Walter S. Cothran, vice president of the National City Bank, had suggested to the state association the idea of putting on a program like the one in Oklahoma. Claude Booker, vice president of the First National Bank, of Rome, was chairman of the agricultural committee.

Both Rome banks have always been interested in encouraging progressive farming. Some 20 years ago the National City adopted a policy of not lending money to any farmer who didn't "live at home," and this revolutionary policy made a big hit with J. Phil Campbell, who was then Director of Extension for Georgia. As a result, Mr. Campbell developed a close association with Mr. Cothran and John M. Graham, the bank's president, and Mr. Campbell readily accepted an invitation to be one of the speakers on the program for the Rome meeting.

Mr. Graham and T. A. Lamar, president of the First National Bank proffered conference rooms and other facilities for working out preliminary arrangements. Mr. Booker, as chairman of the agricultural committee of the bankers' association, had the job of making arrangements for the meeting and every detail was carefully planned.

The Rome News-Tribune played up the event with news and feature stories almost daily for more than a week in advance. The Atlanta papers, which virtually blanket the State, ran several news stories, and The Atlanta Constitution carried an excellent editorial on the meeting, with special reference to the work in soil conservation districts. The Association Press picked up several items, and the small dailies and weeklies in the eight counties in the district carried stories with local angles about award winners. Mr. Booker and Mr. Cothran presented a radio interview about the meeting over Station WRGA, at Rome.

Shorter College, Rome, gave the program enthusiastic support. Miss Louise Bennett, dean of women, presented a humorous talk at the banquet. Three pretty voice students sang in the "mountain music" manner.

Approximately 150 bankers, farmers, and other guests attended the banquet which followed the afternoon session. Guests included the 67 award winners and the members of the board of supervisors for the district, composed of Smiley S. Johnson, chairman; Robert Campbell, secretary; J. G. Brandon, and R. P. Brison.

Walter Cothran, toastmaster, kept the program moving rapidly. Only once did he inject a serious note. That was to express pity for those farmers who, in spite of the opportunity that had been afforded them to improve their farming methods, had chosen not to cooperate with the district and were going on raising cotton and corn year after year without conservation practices while their fertile topsoil washed away and their crop yields diminished. Haynes McFadden, of Atlanta, secretary of the association and known far and wide as an after-dinner speaker, followed Miss Bennett on the program, matching her ancedotes about "Brother Pete's" farm with a few rare ones of his own in the same vein, and the meeting concluded in high good humor.

The preliminary job of selecting the 67 farmers who received the certificates of award from among 1,500 farmers cooperating in the district program was simplified by adopting a score card with various point values for 12 different soil conservation practices included in the district farm plans. To qualify for the awards it was necessary for a district cooperator to have earned at least 90 percent of the points it was possible to earn under his district farm plan and to have established at least a portion of each planned practice. This eliminated a number of farmers who were doing excellent work on most of the program planned for their farms, but had failed to carry out one or two of the planned practices. On the other hand, it clearly emphasized the importance of a complete soil conservation program.

The various soil conservation practices designated by the agricultural committee of the bankers' association and the per-acre point value assigned to each were: Approved rotations established, 10; kudzu planted, 15; sericea lespedeza planted, 15; terracing, 10; water disposal areas established, 10; drainage, 5; woody plantings 5; woodland improvement, 2; wildlife areas established, 3; farm fish ponds constructed, 5 points per pond. Not all farm plans included all these practices, but this did not affect their rating, since scores were based on practices planned for each farm.

The farms were scored by work unit conservationists of the Soil Conservation Service in each county on the basis of the extent to which planned practices had been established on their farms. Nominations were made by C. L. Veatch, district conservationist, to the board of district supervisors, who certified the names to the agricultural committee of the bankers' association. The list of 67 award winners was announced in advance of the meeting and a local committee of bankers in each county invited the award winners to the meeting at Rome for presentation of certificates, and arranged for transportation.

For the benefit of those who had to come relatively long distances from surrounding counties, the afternoon session was scheduled for 4:30 to 6:30 p. m., to be followed by the banquet at 7. The meeting got under way promptly with a call to order by Chairman Booker. Following the invocation by W. F. Byrd, president of the First National Bank of Dallas, Ga., Mr. Booker said that the Georgia Bankers' Association, in line with its policy of supporting the work of existing agencies, had recognized the value of the work the districts were doing through development of complete soil conservation plans for farms in the state, with assistance of the Soil Conservation Service. He expressed the hope that farmers throughout the state would take advantage of the service that was available to them in their local districts.

Mr. Booker read a letter he had received from Congressman Malcolm C. Tarver of the Seventh Congressional District of Georgia, expressing regret that he would not be able to attend the meeting, because of official duties in Washington, but assuring the group of his best wishes for success of the meeting and commenting very favorably on the excellent work being done in the district, with which he said he was thoroughly familiar.

J. Phil Campbell, assistant chief of the Soil Conservation Service, guest speaker on the program, offered the suggestion that soil conservation districts, with their facilities for evaluating farm land on the basis of capabilities rather than that of fluctuating land prices were in a position to do some sound local post-war planning for rehabilitation of returning soldiers. He suggested that district supervisors, in cooperation with local bankers, Soil Conservation Service technicians, county agents, and representatives of other agencies and groups could form committees now that would be able to help on this and other local problems after the war.

J. G. Brandon, member of the board of supervisors, discussed the district program, speaking on the subject, "The Coosa River Soil Conservation District, Its Organization, Aims, and Objectives." Awards were presented by Mr. Rice, president of the Georgia Bankers' Association, who gave a brief résumé of the accomplishments on each farm as he read the names of award winners. A framed certificate of

Farmers who received awards at meeting in Rome, Ga. Officials of Georgia Bankers' Association in front row are, l. to r.: J. Arnold, vice president; George L. Rice, president; Freeman Strickland, treasurer; Haynes McFadden, secretary.

ard was presented to each award winner as his name was id, by one of a group of four pretty girls who served as ges. The 67 award winners were seated in three rows ross the front of the court room.

In responding for the award winners at the conclusion of e presentation ceremony, Posey A. Dooley, president of the oyd County Soil Conservation and Improvement Associan, related how a soil conservation program which he began ck in the days of the old Rome erosion control demonstran areas and continued in cooperation with the Coosa River strict, had completely transformed his farm. He is not ly making a profit from many crops not grown before, but is conserving his soil and getting considerably increased yields from cotton and corn, which formerly were about the only crops grown on his farm. He estimates that the gross income of his farm has increased by more than $5,000 a year since he began conservation farming, as a result of production of new crops, including hay, small grain, and other feed crops, and increased yields of cotton and corn. Last year Mr. Dooley sold $1,000 worth of sericea lespedeza seed from 15 acres of severely eroded and formerly idle land. This year he cut 7 tons of sericea hay from a part of the area and was harvesting the sericea for seed again at the time the meeting was held.

TATE ASSOCIATIONS FORMED

Soil conservation district supervisors in 4 of the 9 States the Southeastern Region have formed permanent State sociations to aid in the exchange of information on adminstration and operation of the local districts and to take part other non-political activities involving the welfare of the stricts.

The Georgia Association of Soil Conservation District upervisors, organized at the conclusion of a two-day meetg in Atlanta, November 18–19, is the latest association to formed. The meeting was called by the State Soil Conervation Committee of which Walter S. Brown, Georgia's irector of Extension, is chairman.

Speakers included H. H. Bennett, chief of the Soil Conservation Service; J. L. Boatman, chief of the division of subject matter, Extension Service, Washington, D. C.; Dr. George King, director of the Coastal Plain Experiment Station, Tifton, Ga., H. P. Stuckey, director of the Georgia Experiment Station, Griffin, Ga.; B. H. Hendrickson, superintendent of the Southern Piedmont Experiment Station, Watkinsville, Ga.; J. Phil Campbell, assistant chief of the Soil Conservation Service, and others.

Added feature was a banquet arranged by Channing Cope, of Atlanta, organizer of the Kudzu Club of Georgia, which was attended by the supervisors and members of the Kudzu Club from throughout the State. (See Dr. Bennett's article elsewhere in this issue.) Chief Bennett was among the speakers on this occasion and also took part in a radio interview with Mr. Cope over Station WAGA. He spoke the following morning before the supervisors' meeting.

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W. N. Holsenbeck, school teacher and farmer of Winder, Ga., was elected president of the Georgia association. Mr. Holsenbeck is chairman of the Oconee River Soil Conservation District. J. M. Gillis, Jr., of Soperton, Ga., Ohoopee River Soil Conservation District, was elected vice president. J. C. Wise, Jr., of Sumter, Lower Chattahoochee Soil Conservation District, and R. H. Gregory, of Chattsworth, chairman of the Limestone Valley Soil Conservation District, will serve with the president and vice president on the executive committee. Dean S. Lott, of Hoschton, Ga., Oconee River Soil Conservation District, was appointed secretary-treasurer.

Similar organizations have been formed in North Carolina, South Carolina, and Alabama. Officers of the other state associations are:

North Carolina Association of Soil Conservation District Supervisors—O. J. Holler, of Union Mills, chairman of the Broad River Soil Conservation District, president; D. S. Rhyne, of Gastonia, chairman of the Lower Catawba Soil Conservation District, vice president; W. W. Eagles, of Macclesfield, chairman of the Coastal Plain Soil Conservation District, secretary. These officers with Wade H. Paschal, of Siler City, Haw River district, and M. V. Lawrence, of Durham, Neuse River Soil Conservation District, make up the executive committee.

South Carolina Association of Soil Conservation District Supervisors—E. C. McArthur, of Gaffney, Broad River Soil Conservation District, president; T. T. Traywick, of Co[...] Edisto Soil Conservation District, vice president; Clifford Smith, of Kinards, Lower Saluda Soil Conservation District, secretary-treasurer. These officers, with J. B. Douthit, of Pendleton, chairman of the board of supervisors for Upper Savannah District, compose the executive committee.

Alabama Association of Soil Conservation District Supervisors—R. T. Jones, of Selma, Central Alabama Soil Conservation District, president; W. R. Cunningham, of Kill[...] Route 1, Northwest Alabama Soil Conservation District, vice president; D. H. James, of Enterprise, chairman, Wiregrass Soil Conservation District, secretary-treasurer. These officers with E. B. Stowers, of Evergreen, Conecuh River Soil Conservation District, and P. G. Compton, of Gallion, chairman, Black Belt Soil Conservation District, compose the executive committee.

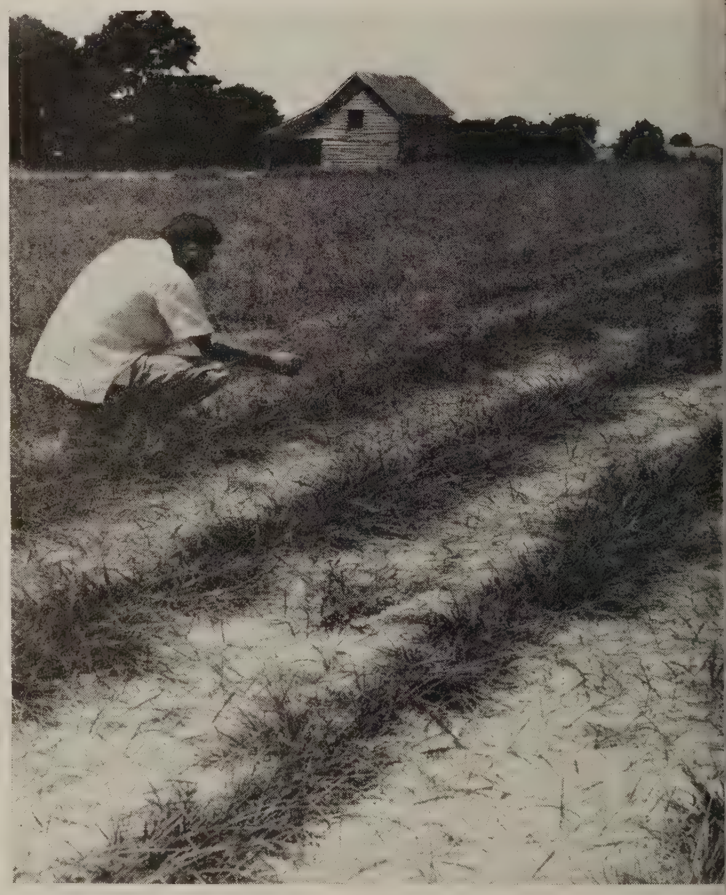
SPEEDING PRODUCTION OF NEW PLANTS FOR SOIL CONSERVATION

By PAUL TABOR

Seventy-three tons of seed of promising new crops for soil conservation have been produced and distributed in soil conservation districts by the Soil Conservation Service nurseries in the Southeast. Most of the seed was of various species of lespedeza. Grasses have been added recently and vetches and clovers also are now being grown by the nurseries for distribution to districts.

Although the Southeast is a natural forest region and native trees are satisfactory for reforestation, its native grasses and legumes are not well adapted for combined intensive use as grazing or hay and full cover for soil conservation. More vigorous growing species are needed for use on different sites. Various introduced grasses and legumes as Bermuda, Johnson, Kentucky blue, orchard, tall oat, Dallis grass and carpet grasses; white, red, Persian, and crimson clovers; common, Korean, Kobe and sericea lespedeza; Florida beggarweed; and Kudzu, have largely displaced the native grasses and legumes for intensive soil conserving practices. Other plants recently introduced either by planned efforts or by accident may be more valuable for soil conservation on some sites than ones now available. The Soil Conservation Service nurseries search for superior

(*Continued on page 186*)



A new, promising pasture plant for certain sections of the Southeast because of its ability to grow on dry sites and because of its drought resistance is narrow leaf Bahia grass. This seed block of Bahia grass is in the Soil Conservation Service nursery at Rock Hill, S. C.

EDITOR'S NOTE.—The author is assistant chief, regional nursery division, Soil Conservation Service, Spartanburg, S. C.

FIVE FARMERS MAKE A PLAN

By P. A. WARING

Five farm families live in Honey Hollow. We vn and work our places singly and separately, but ıring the last 4 years we have discovered an imırtant fact about the stream which winds across our nd. We have learned that it binds us together, and ves us a common problem. And as we have come understand this fact a new approach to our farmıg has developed.

Honey Hollow Creek starts up on the hill on rank's land, crosses and drains Forrest's farm and tewart's farm and then flows through the valley here Charlie and I live. All in all, our watershed as in it about 840 acres of farm land and woods hich have been in use for about 200 years or more. 'e are poultrymen and dairymen and general farm's, and one of us recently has begun to raise steers. ı general, in our neighborhood, most farmers pracce the same kind of agriculture, and though only ne of us actually inherited his farm we have all been ving here for a good many years.

The country in our neighborhood is rolling, but one of the land on our farms can be said to be steep. lowever, for a long while we have known that there ere gullies here and there, and thin spots where rops grew badly. I suppose if the creek had not ventually filled up and flooded all the bottom land, e would have gone on for a good many years in norance of the problem that we now know is pretty erious. But the creek came to give us a real headche, and we were forced to learn our lesson.

The upshot of this situation was that we went in r erosion control. We went in for stopping the bvious silting in of our stream, and the now obvious act that this silt was the soil fertility upon which e were trying to build our homes and our farms. Ve went in for, at least, thinking about the problem nd planning the work together. The stream had ıught us that. The stream had shown us that we id not own five separate parcels of land, but that in sense these five farms belonged together, as far as nderstanding the problem of erosion was concerned, nd the job of planning for its control must be a ingle job. Frank had said one day when we met to alk over what we would do: "You fellows down ıere in the valley can't solve the problem by yourelves. Your trouble really starts up on my farm here the creek rises. We will have to solve it ogether."

And Frank was right. After 4 years of planning and working together on this problem we know that as far as the control of erosion is concerned we have to think in terms of our watershed, and not in terms of five separate farms whose boundaries really bear no relation to the shape of the land. If you should come to Honey Hollow today you would see that we have made a beginning. You would see that all our crop land is now plowed and planted on the contour, and that we are following a general plan laid out for the whole 840 acres. Of course we each do our own work, except now and again when we lend a hand to one another on some special job. But we have planned the way to handle our land together. And there have been good results. Gullying has been greatly reduced, our stream no longer goes quickly into flood, endangering crop land, and already we are beginning to see increases in the yield per acre of our crops.

This experience has in turn taught us something else. We are beginning to see that perhaps there is a bigger job than erosion control which we can think about and plan together—a job of which erosion control is but a very important part. We are beginning to see that it is possible to build a permanent agriculture here on our places, and that perhaps this means doing a whole lot of things besides those which we are now doing. Perhaps it means more than better pastures, better rotations, better relations of our livestock to our cropping, contour strip planting and terracing; perhaps it means the development of wildlife conservation for our whole area.

Most farmers sooner or later learn the value of birds in the production of crops. Few of us do anything about it, for we are usually so busy with the immediate job of earning a living that we never get to doing what we know would be wise and good. Moreover, it is sometimes difficult to figure out what one family can do on one small farm.

Over the years the cropland on our five places has been widened, the woods areas further separated, the hedge rows cleaned up. All of this has tended to reduce the cover for wildlife. We and our forebears have done this to get more land for crops and thus earn more money. Most farms hereabouts have gone through this process. Bird life has suffered, and if the fact were faced by most of us, our pocketbooks also. But the fact usually has not been faced, and we farmers in Honey Hollow are no exception. We have

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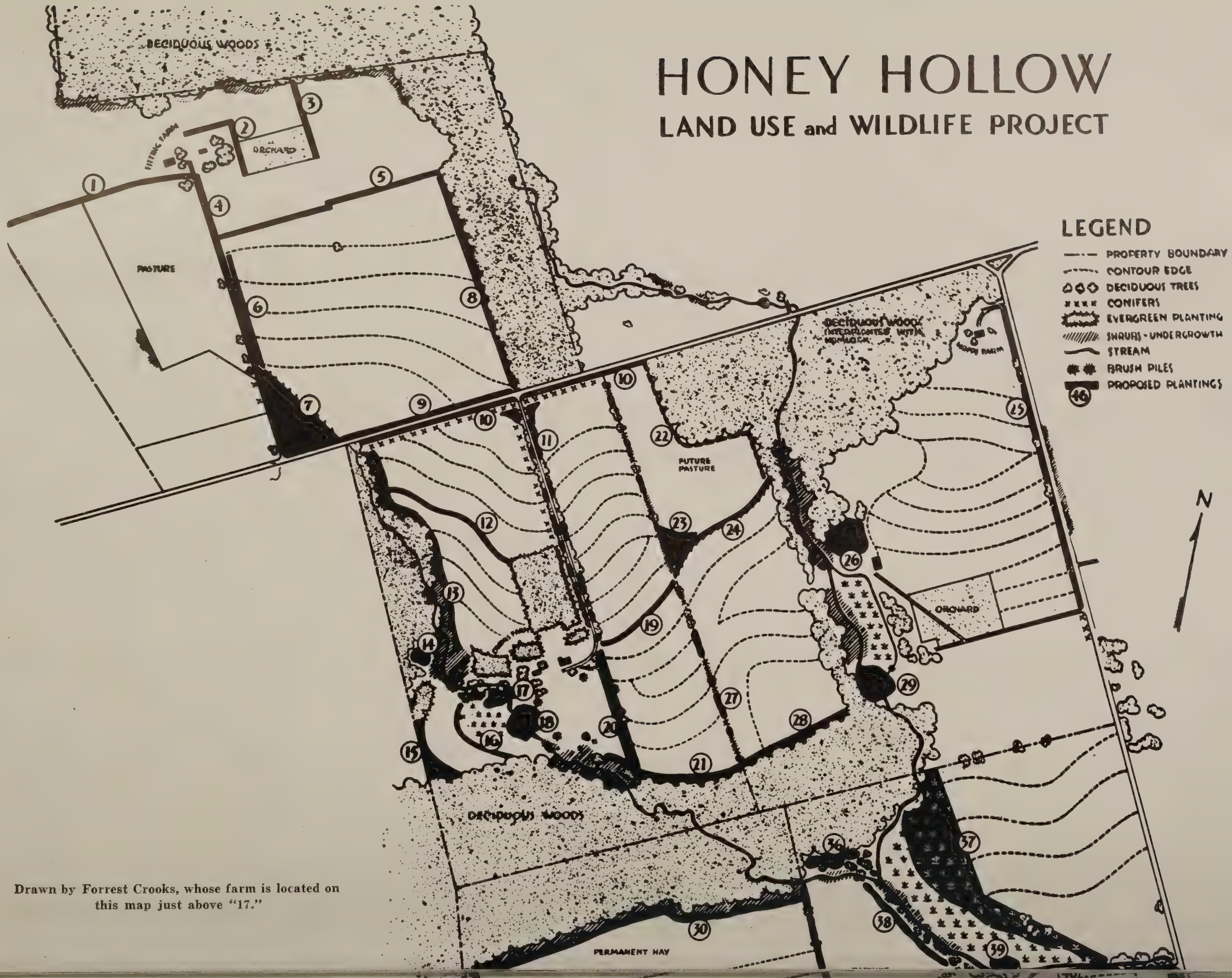
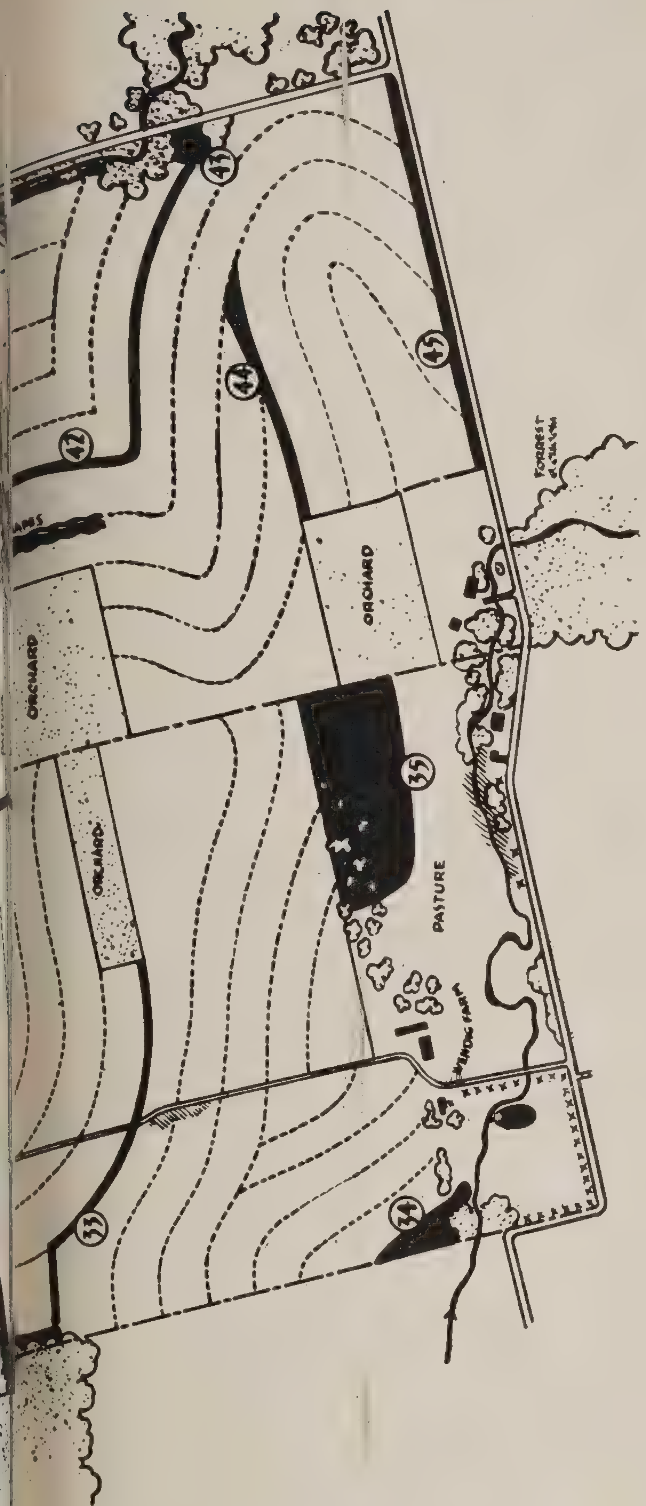
Editor's Note.—The author is a farmer in Bucks County, Pa. ı collaboration with W. M. Teller, Mr. Waring is co-author of the ew book *Roots in the Earth: the small farmer looks ahead*, a review which is to be found in this issue.



Drawn by Forrest Crooks, whose farm is located on this map just above "17."



1, 5, 31, 44	Hedge planting.
2	Windbreak.
3, 27	Hedgegrow interplanting.
4, 9, 10, 11, 25, 40, 45	Road bank planting.
6	Hedge planting on terrace outlet berm.
7, 15, 23, 34, 43	Odd corner planting.
21, 32, 38	Field border planting.
8, 13, 20, 28	Field border seeding.
30	Field border selective cutting.
12, 16, 19, 24, 33, 42	Contour hedge.
14	Interplanting.
17, 41	Streamside planting.
18, 29, 39	Farm pond.
22	Woodland fencing.
26, 35, 36, 37	Woodland planting.

felt that we simply did not have the time to plant hedgerows and to redevelop cover, along with the pressing business of caring for stock and planting and harvesting grain. Not until recently did we stop to consider whether we could afford to neglect this side of farming if we were to develop a really permanent agriculture.

Now, in the business of planning for erosion control we had drawn a map of our five farms and of the stream which drains them, the woods areas which dot them here and there, and the existing hedge rows. Our map showed us what we had and what we did not have. It was easy to see that the wooded areas were not connected, that there was no continuous cover for birds, that crop land on the whole was in wide open spaces uncut by hedgerows.

It is sometimes easier to see the whole of a situation by looking at a map than when walking about your farm. And it certainly helps in grappling with a problem like this one, which covered five farms and not one. At any rate the map visualized the matter. And as is often the case, the difficulties did not seem so great when we began to think about them together as when we had tried to think them through separately and alone. Moreover, we had learned the value of cooperation from our erosion control work and were more ready to tackle what proved to be an expansion and development of the watershed conservation plan.

The result of all this business, which went on for about a year, is that we have made a plan. Without a plan, we know that we should get nowhere. With it, we have a goal to strive for. Our plan sets no limits on finishing our project, for we knew we would have to work within our capacities of time and strength and money. But we agreed to do our best, each on his own place.

We asked the Soil Conservation Service to advise us. We set as our aim in planning a wildlife project the association of this with all the other things we might do to build a permanent agriculture for Honey Hollow. Conserving had meaning only when undertaken by us as farmers and as part of our agriculture. It is, after all, not something separate and distinct in itself, but an integral aspect of a plan for proper land use.

The framework of our plan, as shown on the map, lies in developing continuous cover for wildlife throughout the whole watershed, where farm woodlot is connected with farm woodlot by field border hedges, and by contour hedges of berry-bearing and nut shrubs, and nut and fruit trees, and conifers for winter protection. These hedges, along with islands of shrubs grown in the nooks and corners of our places least desirable for crops, will provide travel-

ways, food, shelter, and nesting sites for birds and some small animals, and will serve to break up the large sections of crop land.

Our idea is not to develop a project from the standpoint of game management, but to conserve wildlife for the sake of better land use, the sake of our crops. We have begun to realize that we farmers have unbalanced nature by our neat clearing of land, and that the old ecology is gone in most agricultural areas. We have come to realize this with sorrow as cut worms, beetles of many kinds, and many pests which attack the farmer have increased. Whether a return to normal of the bird population will solve our difficulties we are certainly not now prepared to say. But it seems logical, and the work of such agencies as the Audubon Society and of the Department of Agriculture would certainly point to the fact that it is desirable from every standpoint to try to bring about a return of the balance in nature.

Subdivisions of our Honey Hollow project are as follows:

1. Planting of hedges and shrub islands.
2. Planting of woodland edges.
3. Planting of windbreaks, roadsides.
4. Stream development for better wildlife and farm use.
5. Increasing of field edges by breaking up large fields into contour strips of crops.

It is clear to us as we look at our plan that there is much to do in planting this cover and in developing our stream. But we know that we do not have to finish it in one year or two. Moreover, some of it we have already accomplished by converting square fields into contour stripped fields and thus increasing the field edges which will tend to bring small birds out into the open areas more than heretofore. And some gains in work will lie in allowing hedges to grow up and thicken rather than keeping them clean.

Nevertheless, there will be a good many shrubs and small trees to plant and this will take time and labor which will have to be spread over some years. The Soil Conservation Service has agreed to help us by supplying some free or low-cost nursery stock because it is interested in the cooperative aspects of our project.

This is our plan. We have already made a beginning with it. Last spring we each planted a hedge row, some by thickening an old and established row, some by beginning a new one on the contour, and all by following the plan upon the map. We can mark off a little area of accomplishment, and we have learned something about our capacity to do this work, even in the busy spring season. We are following the advice of the Soil Conservation Service in the selection of planting stock. We are also seeking knowledge from such fine books as William R. Van Dersal's *Native Woody Plants of the U. S., Their Erosion Control and Wildlife Values*, and the National Audubon Society Circular by Peterson called *Trees, Shrubs, Vines for Attracting Birds.*

Trees and shrubs grow slowly. It will be years before we have a showing for our work. But we know this. The cycle of farming is always long, and we have learned to understand this fact over the years. Nevertheless, we have the confident feeling that something is started that is good and in the direction of permanent agriculture for Honey Hollow.

TREES SAFEGUARD WATER SUPPLY

Plantations protect Hanover Municipal Reservoir.

In 1930, the busy industrial wheels of Hanover, Pa. (population 18,000) stopped turning when the municipal water supply system failed.

Today, with all factories turning out war products, Hanover is assured of a steady water supply because the city not only built a new and large reservoir but took steps to protect it from excessive runoff and silting by systematically planting the watershed to trees.

More than a thousand acres of the watershed of 1,412 municipally owned acres—391 of them in Maryland—has, during the past decade, been planted to 1,026,000 trees—red and white pine, and Norway and white spruce.

Many of the trees are going on 11 years old, big sturdy fellows, and the streams feeding the reservoir run clear and full. Waterworks Manager Roy W. Straley says very little silt gets into the 202,000,000-gallon reservoir. Acquisition of a few more tracts in the watershed will complete the city's land-buying program. But Mr. Straley isn't worrying about erosion from one field still privately owned—it's farmed in contour strips.

WHERE SHALL WE GET THE SEED?

By GROVER F. BROWN

The war demands for beef, pork, eggs, poultry, milk, and other livestock products, have been met suprisingly well. To continue meeting such demands we must be assured of a plentiful supply of livestock feed—and that demands seed supplies.

So much emphasis has been put on livestock products themselves that the use of forage for seed production largely has been lost sight of. We might expect farmers to make fully as great effort to meet seed goals to meet livestock products goals if they knew the urgency of the need. Information regarding the National forage seed situation should be placed before farmers, and patriotic emphasis placed on reaching the desired seed goals.

The National over-all seed picture is not bright. A number of factors operated to affect the production of seed last year—some favorable, some unfavorable. Price support came too late to achieve maximum benefit. Fortunately, the market price has been so strong that price support was generally not needed.

Total livestock population has increased to an all time high. This calls, of course, for greater quantities of hay and pasture, which reduces to that extent the acreage harvested for seed. With hay selling from \$20 to \$30 per ton, the price for seed must be correspondingly high to meet the competition, but to grow this increased feed we must have the seed to plant. Thus, is the circle completed.

Considerable winter killing of some of our legume stands occurred last winter. This resulted in some reseeding, increased the pressure for livestock feed, and somewhat disrupted crop rotations. Part of this winter killing was a consequence of planting unadapted seed; the loss to the Nation, because of the use of unadapted seed, looms very large.

Present indications are that the heightened demand for food will continue during 1944 and for at least a year or two after the defeat of the Axis. Many of our hay and pasture plantings must be renewed before then. We hope the seed for this purpose will be available.

Lend-lease has cut into the National supplies of forage crop seeds some extent, but in general has not been sufficient materially to affect the supplies available for local consumption. During 1942 Russia and the United Kingdom were the two heaviest users of forage seeds, each taking over 14,000,000 pounds. In 1943 Russia is not requesting forage seed but is asking an increased supply of vegetable seed. The United Kingdom requested some 19,000,000 pounds of forage crop seeds for 1943 but was allotted only about 12,000,000. In 1942 Russia bought heavily in alfalfa, alsike, red and crimson clovers, brome, orchard, timothy, crested, and perennial ryegrass and the vetches. The United Kingdom then needed mostly alsike, red and crimson clovers, together with orchard grass and timothy. In 1943, the United Kingdom wanted more orchard, meadow fescue, Kentucky bluegrass, timothy, alsike clover, red clover, common vetch, and fodder corn than other kinds of forage seeds. It is unfortunate that our supplies are insufficient to meet our own needs plus those of our allies, because in terms of food units, a great deal more can be shipped as seed than can be shipped in the same space as processed foods.

The data on seed prodution and prices in the accompanying table were obtained from the Division of Agricultural Statistics, of the Bureau of Agricultural Economics, and represents the best information as of December 1942 and 1943. Prices to growers are on the basis of clean seed and, of course, are far below retail prices. The spread in prices between the two dates does indicate to some degree the relative seriousness of the seed supply situation. Similar data were desired on all grasses and legumes, but the ones included here are the ones of largest significance in terms of forage.

If one were asked to name the single measure that is most important in soil conservation and crop production, cover crops would be sure to make a lusty bid for consideration. There are millions of acres that should be planted to cover crops each year and this calls for an annual supply of seed far greater than is now available. Many farmers can and do grow their cover crop seed, and more should follow their lead.

One of the great needs of the Southeastern States is a good legume cover crop. Austrian winter peas have shown promise, but unfortunately most of the seed is produced in the Pacific Northwest, and shipped across country for seeding. The interval between harvesting in the Northwest and planting in the Southeast is so short that much of the seed must be held over for the following year. This involves

EDITOR'S NOTE.—The author is assistant chief, division of agronomy, Soil Conservation Service, Washington, D. C. Dr. Brown makes acknowledgment to E. A. Hollowell, M. A. Hein, and H. M. Tysdale of the Bureau of Plant Industry, Soils, and Agricultural Engineering, and G. C. Edler, of the Bureau of Agricultural Economics, for information on this subject.

CLEAN SEED PRODUCTION, CARRY-OVER, AND PRICE TO GROWERS

Kind of seed	Amount produced, pounds		Carry-over, pounds		Prices * to growers per 100 pounds	
	1942	1943	1942	1943	1942	1943
Sweetclover	29,088,000	21,420,000	11,996,000	8,862,000	$6.82	$9.
Hairy vetch	32,020,000	21,680,000	2,840,000	11,170,000	10.00	11.
Alfalfa	47,826,000	56,034,000	13,216,000	4,999,000	26.66	32.
White clover	1,890,000	2,080,000	891,000	594,000	40.50	[1] 43.
Alsike	12,228,000	11,826,000	5,873,000	2,723,000	19.80	27.
Red clover	49,728,000	55,028,000	40,232,000	23,276,000	19.28	30.
Lespedeza	135,969,000	129,671,000	19,075,000	8,718,000	5.86	9.
Austrian winter peas	133,300,000	154,000,000	1,643,000	61,093,000	5.00	5.
Ladino	360,000	345,000	206,000	61,000	[2] 70.00	125.
Crimson clover	17,080,000	14,140,000	3,564,000	6,302,000	10.70	10.
Sudan	37,300,000	30,900,000	25,652,000	8,510,000	2.60	7.
Timothy	69,408,000	62,127,000	15,433,000	32,720,000	4.56	5.
Redtop	16,600,000	10,300,000	13,837,000	13,476,000	6.40	14.
Ryegrass	33,300,000	26,800,000	8,769,000	9,467,000	5.00	7.
Orchard grass	6,090,000	5,726,000	434,000	270,000	20.05	24.
Bromegrass	8,902,000	6,885,000	2,159,000	4,147,000	-----	12.
Ky. bluegrass	33,162,000	10,800,000	10,265,000	19,466,000	5.60	[3] 10.
Meadow fescue	1,225,000	1,175,000	185,000	182,000	7.00	12.
Crested wheatgrass	12,008,000	3,883,000	987,000	862,000	-----	9.
Bermuda	865,000	1,000,000	-----	16,000	-----	-----

* Best available average prices and therefore subject to variation for any particular locality.
[1] Wisconsin.
[2] Oregon.
[3] Cured price.

not only an additional expense to the Southeastern consumer but necessitates large storage facilities. Consequently, there is a great need for cover crop seeds to be produced in the Southeast for use in the same area.

Seed of crimson clover, bur clover, blue lupine, vetches, crotalaria, and wild peas can all be produced in the Southeast and the acreage should be increased rapidly.

Sweetclover is a very valuable pasture legume in certain sections of the country. It has an exceptionally high carrying capacity, is relatively easy to establish, and the seed has been quite reasonable in price. Our seed production during 1943 was considerably below that of 1942, with a corresponding smaller carry-over to bolster the low 1943 production. The 1943 production was only about 40 percent of the average annual production in the five-year period 1937–41. This can mean much less pasture during the two critical years immediately ahead.

As to alfalfa the seed situation is affected by a number of factors. We are very short of seed adapted to the northern region; we have enough for the central region; there is a surplus in the southern region. In view of this set-up there is a tendency for seed from the Central and Southern States to move north where it is unadapted. Many failures of both new and old alfalfa stands in the Central and Northern States during the winter of 1942–43 can be laid directly to the use of unadapted seed, seed not sufficiently winter-hardy to survive the cold.

So much southern-grown seed has moved north that a seed shortage was claimed in this area. To satisfy this condition, some 2,700,000 pounds of Argentine seed were imported for use south of 38° latitude. Such a situation can be the result of poor planning on the part of seed dealers, or it can b created purposely to take advantage of a price di ferential on imported seed. For example, the pric of Argentine seed laid down in this country was ap proximately 16 cents per pound to the wholesale and could be sold at 31.9 cents wholesale or 42.9 cen retail, the same as allowed for southern-produce seed—a possible margin of about 28 cents per poun Restriction of imports of Argentine seed until ther is a real shortage in the areas where such seed adapted, is being seriously considered.

In view of the shortage of seed adapted to th northern areas, particularly of some of the newer wil resistant varieties such as Ranger, consideration being given to growing such varieties in the centr and southern sections to produce seed adapted in th north. It is unlikely that the genetic quality o northern-produced seed would deteriorate for at lea the life of the original planting of northern seed the south. Thus, northern-bred seed could be in creased farther south for use in the north, and th southern seed producer would not only benefit fro growing seed commanding a higher price, but th northern seed user would be assured a more plent ful supply of well adapted, disease-resistant see From tests conducted by the Bureau of Plant In dustry, Soils, and Agricultural Engineering and Sta Experiment Stations, northern adapted varieties suc as Ranger, will produce just about as much seed an with but a slight reduction in yield of hay wh grown under southern conditions as compared to th local southern varieties. At present prices, certifi northern-adapted seed is about 14 cents per poun higher in price than southern-adapted seed; ther fore, it is much more profitable to the southern se grower to produce northern-adapted seed.

adino clover is one of our most valuable pasture umes and is annually producing many millions pounds of beef and milk. It is one of the highest age-producing legumes where it is adapted and limited amount of available seed is the only reason ny more thousand acres aren't seeded. New York te alone wants more ladino seed for seeding new y and pasture fields than was produced in the entire ntry during either 1942 or 1943. The produc-n of seed during these two years was below the rage annual production for the five-year period ween 1937 and 1941. In fact, we failed by 75 rcent in 1943 to reach our seed production goals for lino. This was due to a number of factors but high value of hay and pasture in the seed-produc-g areas and the drive for more milk in these areas re major contributing factors to the failure to ch the desired goals. The appeal for more milk d meat went out to the seed-producing farmers the ne as to all others with the result that such farmers reased their own dairy and beef herds and de-eased to that extent their seed production. If they d increased their ladino seed ouput, such seed nted all over the country would have resulted in much greater increase in meat and milk than was tained on these individual seed farms.

It is becoming increasingly difficult to maintain re stands of ladino for seed. Common white clover contaminating some of the ladino fields in Cali-rnia to the extent that certification is out of the estion. This is quite a serious matter when it per-ins to a legume as valuable in the hay and pasture orld as ladino. It may, therefore, take more than favorable price or a patriotic appeal to seed growers get the desired production.

Sudan grass is one of the most important summer sture and hay plants in this country. Every sum-er it produces many millions of pounds of milk d meat products. Because it is a summer annual, ed as a supplementary pasture and hay crop, it is ry important that a plentiful supply of seed be ailable each year. It is particularly important ring drought periods, and because droughts can-t be predicted 6 months or a year in advance we ust be prepared for any eventuality. The present udan seed situation is unfavorable for next summer lantings, especially if conditions are such as to de-and considerable quantities of Sudan. We failed y over 40 percent to reach our 1943 goals in the pro-uction of Sudan seed. Our production of Sudan ed in 1943 was about 7,000,000 pounds less than in 942 and, in addition, we had almost 13,000,000 ounds less carry-over than we had in 1942. This uts us into next summer's planting with something less than 20,000,000 pounds below the supplies we had on hand at the beginning of this year's planting season. In addition to this, the production of seed during both 1942 and 1943 was far below the average annual production for the five years from 1937 to 1941; the production in 1943 being less than half the 5-year average. The price increased to the grower between November 1942 and November 1943, from $2.60 to $7.15 per 100 pounds clean seed, a serious factor in itself. In view of this, we need to be excep-tionally careful regarding the way we conserve and use the amount we do have. Every reasonable effort should be made to bring our seed production this coming summer up to somewhere near the average annual figures so the supply for 1945 will be more favorable.

Bromegrass is rapidly filling a much needed spot in our hay-pasture program. It is proving to be the best grass to include in mixtures with alfalfa over most of the northern half of the country. It is en-croaching into the area where timothy was once king of the hays. In recent years, it has become apparent that the place of origin of brome seed is just about as important in evaluating the seed as in the case of alfalfa seed. Seed produced north of the 42° longtitude is to be preferred for planting in the North over seed produced south of that line. On the other hand, seed grown south of that line in Nebraska and other States produces higher yields when planted under the warmer conditions than will seed from the north. Our total production in 1943 was about three-fourths of that produced in 1942, and was only about 49 percent of the brome seed goal set for 1943. If we are to keep up our brome production, the acreage harvested in 1944 will have to be higher than in 1943.

In the Northern Great Plains area crested wheat-grass is producing beef par excellence. Data ob-tained from experiment stations, such as the one at Moccasin, Mont., show that crested not only has a high carrying capacity but that the hay quality is practically as high as alfalfa and the plant's ability to grow under conditions of limited rainfall is creat-ing a real place for it on the ranges and farms of that section where meat production is so important. Our seed production in 1943 was only about 38 percent of that in 1942, yet the demand for seed has increased. Some part of the smaller production this past summer was due to the cold, dry period in early spring that adversely affected normal seed produc-tion.

The Departmental Seed Production Programs Committee is making excellent strides toward clear-ing away much of the past confusion concerning the

(*Continued on page 190*)

Seed of *Lespedeza hedysarioides* grown in Soil Conservation Service nurseries in the Southeast are supplied to farmers in soil conservation districts who are interested in growing more hay. This seed block in the nursery at Chapel Hill, N. C., shows the dense cover provided by this relatively new perennial legume.

(*Continued from page 178*)

new plants, make observational plantings of them, and increase the seed or vegetative parts of the best kinds.

Before seed increase of a crop is undertaken, that crop must show real promise for soil conservation. It may show this promise in an introduction planting at state agricultural experiment station, on a farm, or in initial observational plantings at Soil Conservation Service nurseries. If the crop is good enough for approval of agronomists or biologists of the Soil Conservation Service and the State Agricultural Experiment Station, its seed are rapidly increased at the nurseries and used in soil conservation work.

One example of a new plant, which has been increased and distributed is *Lespedeza hedysarioides*, previously misidentified as *Lespedeza juncea*. The original seed were substituted by Japanese seedmen for an order of *Lespedeza bicolor*. Despite such a mistaken identity, the crop showed promise in the nurseries and was approved for seed increase by agronomists. The seed producing acreage in the nurseries was expanded as rapidly as possible and a wide distribution of seed made for use on farms cooperating with districts. In 1943, 5,490 pounds of seed were produced and distributed for soil conservation use on farms cooperating with districts. Since 1936, a total of 42,500 pounds of seed has been produced and distributed. Seed of *Lespedeza hedysarioides* is now appearing in the commercial trade channels. When it becomes well established there, the production on Soil Conservation Service nurseries naturally will be curtailed.

Seed and seedlings of the large bush lespedezas, *L. bicolor*, *L. cyrtobotrya*, and *L. thunbergii* have been produced at the request of biologists. The Bureau of Plant Industry, Soils, and Agricultural Engineering supplied the first seed of these species for increase. There has been a steady increase in acreage for seed production, using the steepest and roughest lands on the nurseries for this purpose. A total of 600,000 seedlings and 6,165 pounds of seed of these lespedezas was produced and distributed from Soil Conservation Service nurseries in the Southeast during the fiscal year 1942–43.

The third example is the increase of seed of Bahia grass, a valuable pasture plant. Strains of Bahia grass, *Paspalum notatum*, were obtained from Texas from the Bureau of Plant Industry, Soils, and Agricultural Engineering and from local collections made in Florida and North Carolina. The behavior of these strains was studied in the initial observational plants at Thorsby, Ala. and Chapel Hill, N. C., nurseries. Strains collected at Pensacola, Fla., and Wilmington, N. C., have produced the largest growth and endured winter cold with least injury. With the approval of agronomists of the Soil Conservation Service and State Agricultural Experiment Stations, the increase of seed of these better strains has begun.

Seed increases are also being made of medium hop clover, *Trifolium procumbens*, subterraneam clover, *Trifolium subterraneum*, wild winter peas, *Lathyrus hirsutus*, large flowered vetch, *Vicia grandiflora*, local strains of meadow fescue, *Festuca elatoir*, red fescue, *Festuca rubra*, red top, *Agrostis alba*, and superior selections of both Korean lespedeza, *Lespedeza stipulacea*, and sericea lespedeza, *Lespedeza sericea*. Rootstocks of two heavy yielding strains of Bermuda grass also are being increased.

Under the leadership of D. G. Craig, regional training officer at Albuquerque, N. Mex., a class of staff members has been organized in public speaking. This is the second such undertaking in the Soil Conservation Service, the first has been in being for some time in the Milwaukee office under the guidance of E. J. Peterson, regional training officer.

The fundamental principles of giving prepared subject matter, radio talks, after-dinner speeches, impromptu responses are studied. Every participant has a chance on the floor and also acts as constructive critic.

SWEETCLOVER'S UNIQUE ROLE IN SOUTHWEST

Tv stages of revegetation, as revealed on farm of R. E. Pierce, Upper Washita Soil Conservation District. At left, native gr ses already well established; blue grama predominates, with a scattering of sideoats grama and little bluestem. At rig t, second-year growth of sweetclover on land to be planted to native grasses in spring of 1944, as Pierce retires eroding cu vated land to vegetation while keeping the land in war production. The clover is making a heavy seed crop; it is also used for hay and grazing.

By KENNETH YOAKUM

weetclover is helping western Oklahoma farmer to return eroding cultivated fields to native gisses while keeping the land in war production.

arly revegetation efforts proved the need for a gund cover to protect seedling grasses, and at first stan or sorghum was used. Results were excellent, bi the land reseeded was out of production for at le t 2 years. Howard and John Flick, father and sc, cooperators of the Upper Washita Soil Conservation District, encountered this problem, and overcame it with assistance from Soil Conservation Service technicians. Here's the experience of the Flicks:

"We got a good stand of native grass in our demonstration plot and are well pleased with this native grass seeding. We planted Sudan in 1939 to provide a cover in which to seed our native grass in the spring of 1940. But we lost the use of the land for 2 years under this method.

ITOR'S NOTE.—The author is work unit leader, Soil Conservation Se ce, Hammon, Okla.

H ard Flick, whose farm is northwest of Hammon, Okla., e nines grass-sweetclover pasture third year after seeding to ative grasses. Sweetclover has persisted, increasing the the amount of grazing and improving the soil.

Beef being produced on farm of M. B. Hart, near Geary, Okla., on pasture of 1- and 2-year-old sweetclover, Bermuda grass and native grasses that were seeded May 12, 1941.

"With agricultural products so badly needed for war consumption, we must find some way to obtain production from these eroded acres and at the same time prepare to get these acres into grass.

"We have learned that the most practical way is to seed the land in sweetclover 2 to 4 years before planting native grass seed. This permits livestock to graze these areas, and also provides a cash crop through the sale of seed."

This procedure is widely used, and up to this time 784 Upper Washita Soil Conservation District farmers and ranchers have seeded 3,695 acres to native or adapted foreign grasses. The method is supported by experimental results at the Red Plains Conservation Experiment Station at Guthrie, Okla.

Sweetclover adds vitally needed organic matter to the soil, and stores nitrogen for the use of the grasses that are to follow. Howard Flick finds that after 2 years of sweetclover the soil is "soft and spongy and has a good leaf mold among the old sweetclover stubble." In the most severely eroded spots, where a good cover of sudan could not be obtained, sweetclover has done well. After the sweetclover has prepared the ground, the native grasses can be seeded. The sweetclover continues to appear with the grass for a number of years and makes a mixed clover-grass grazing liked by the farmers of the district. The Flicks used a mixture of 10 pounds of blue grama, 1½ pounds side-oats grama, 2 ounces of African weeping lovegrass and of sand dropseed per acre in the sweetclover. These grasses were ready for grazing the second year after planting, although a seed crop of sweetclover had been harvested each of the 2 years. The Flicks said that grass growing with sweetclover is "a dark green and where there is no sweetclover the grass is a pale yellow color."

Volunteer sweetclover, farmers have said, does give the seedling grasses some competition, but it is their opinion that the clover does more good than harm. As the grasses spread and become thoroughly established, the clover is expected to disappear—but until it does its contribution is increased forage production and increased soil fertility.

Both white and yellow sweetclovers are planted. Yellow sweetclover can be combined easily for seed, and the white sweetclover usually is so rank that it is cut with a binder and threshed with a combine after curing.

On the Flick farm, seed and honey are byproducts of the revegetation program. Three thousand pounds of white sweetclover seed were harvested from 10 acres that will be seeded to native grass next spring.

Honey is a byproduct of the use of sweetclover as a st returning eroded western Oklahoma land to native gras John Flick (left) and his father have 15 stands of bees h produce about 30 pounds of sweetclover honey per e during the blooming season.

"I don't know of anything else that would a made us as much pasture, would have contr erosion, given us a cash income, and helped us get land ready for seeding of native grass," Howard Fi explains. "We have 15 stands of bees and durin t growing season we got about 30 pounds of honey a week. You can tell where that honey is coming fr as it is clear in color and has a vanillalike s to it."

Jim Hall, a former supervisor of the Up Washita Soil Conservation District, in 1942 c bined 3,000 pounds of sweetclover seed from a 30 planting of native grass in 1942, and 6,500 p of sweetclover seed from eroded land he will to native grass.

Forest Boal, who has completed a soil and w conservation farming program with district e has been using a combination of rye and sweetc for temporary pasture during the last 5 years a reports that the combination has given more pa than anything else he could have. The 20-acre growing rye and sweetclover is terraced.

"I just let the rye and sweetclover fight it u Boal said. "Sometimes I think the clover is to pass out of the picture, but it always manag come back and furnish lots of grazing. I tak sheep off the rye in time for it to make sufficient and then one-way the land lightly each fall. I clover making seed every year under this meth temporary pasture, as well as first year clover ing every spring."

Sweetclover also is used in combination with t small grains. R. E. Pierce, another district c

, planted 15 acres of sweetclover with oats last ng. The clover was broadcast in front of the n drill.

n 12 acres of second year sweetclover which is to ollowed by native grasses he carried 12 cows dur- March, April, and May, permitting the defer- t of grazing on native grass pastures at a time n the grasses needed protection from grazing.

n order to speed the reseeding of native grasses hallow soils, steep land, and eroded soils, many ners in the Upper Washita Soil Conservation rict have been combining native grass seed that be planted following 2 years of sweetclover. In 1942 more than 3,300 pounds of native grass seed mixture, consisting principally of blue grama with some side-oats grama and little bluestem, were harvested. John and Howard Flick harvested 354 pounds of grama grasses from seeded pastures in 1942 and planted it in 1943 on 37 acres of land where sweetclover had been grown 2 years.

Planting sweetclover in native grass pastures, in Johnson grass pastures and meadows, and in weeping lovegrass is proving to be a desirable practice in a number of soil conservation districts in the Western Gulf Region of the Soil Conservation Service.

THE DIARY OF AN AWAKENING FARM

ortly to be released by the Department of Agriculture's o-reel, color-sound film, "For Years to Come." It is a l, realistic, unique production chronicling the changes ught by soil conservation on one typical farm within a le 12-months' span.

e farm belongs to Christian B. Musser, York County, —but the transformation parallels what has happened, ppening every day, on countless other farms in Georgia, sissippi, Utah, Oregon, Nebraska, Iowa.

usser was considered a good farmer. Today, he is an better farmer. The new film is a faithful record of the ful first year in which he swung from the old system to new. It shows his straight rows giving way to curves, square fields changing to strips gently following the con- of the land. In this brief time, mossy tradition is swept y and the Musser farm puts a new plan into effect—a which safeguards the soil and brings about increases in luction.

hotography started on the Christian B. Musser farm in tember 1942. It followed right along through the year, last "shots" being made the first of November 1943.

he cameraman, Rodney B. Radford, made some 20 trips he farm. Harvest operations up and down the hill were tographed in 1942, the usual jobs around the farm during fall and in the snow-bound winter.

he spring sequence opens with atmospheric scenes—blos- s, dogs, a few pigs, and ducklings. This is followed by ato cutting and then the laying out of the contoured po- and soybean fields. Planting follows, as do all opera- s in regular order, and the unusually dry season termi- es with Musser very much pleased with what he has ac- plished. He had obtained more corn from 28 contoured es than from 33 straight-row acres the year before. Due drought, all crops on the Musser farm and throughout the ality were below normal, but because of the water stored by contouring, Musser's yields were far above the community average.

The film shows pointedly that the change-over is not difficult, and that the usual farm jobs go on without interruption as soil conservation is invoked.

The film lasts 22 minutes, has good music. The first print is scheduled for review in Washington sometime in March, soon after which it is expected that prints will be available for distribution.

CARROTS ON THE CONTOUR

Through the efforts of Miss Marjorie Gilbert, home demonstration agent in DeKalb County, Tenn., and the DeKalb County Soil Conservation District, more than 30 farm gardens, comprising 25 acres, were planted on the contour in the county.

Miss Gilbert became interested in the possibilities of contour planting of gardens when she attended a meeting of the district supervisors in January. Representatives of various agencies were invited to the meeting for a study of widespread conservation practices to aid in the war food production program.

Contour cultivation was emphasized and it was pointed out by Charles L. Lenning, Jr., work unit conservationist, that this practice would help to conserve soil and plant food, as well as moisture needed in the production of crops.

Recognizing the importance of adequate moisture for garden crops, Miss Gilbert attended a demonstration by the conservationist on laying out contour lines with the aid of a carpenter's level and later held a number of demonstrations herself for women throughout the county.

Although the work didn't get under way until late in the season this year, the 30 contour gardens are considered a good beginning, and plans have been made to get an early start on the campaign for contour planted gardens this year.

SOIL CONSERVATION
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SECRETARY OF AGRICULTURE
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REVIEWS

ROOTS IN THE EARTH. By P. Alston Waring and Walter Magnes Teller. New York. November 1943.

When I wake up at 2 a. m. and start to read a book in the hope that reading will make me sleepy; when at 3:30 a. m. I am so absorbed in that book that I am reluctant to go back to bed; and when even at that hour, I can only get back to sleep by drinking a glass of hot milk-and-something—why, then you might say that book is somewhat more than casually interesting.

This is not to say that ROOTS IN THE EARTH is merely interesting—it is one of the most searching books about America that I have read for quite a while. Nevertheless, it is particularly important that a book of this type be interesting reading, simply because the more interesting it is, the more people may be expected to read it, and that is vital. Unread books don't wield much influence.

ROOTS IN THE EARTH isn't what you might judge from the title. It isn't a treatise on plants, nor is it a book on "how to be a farmer" in the usual sense of telling what and how to plant, what to do at lambing time, and so on. It is distinctly not a back-to-the-land book. Anything but—and you'll see what I mean when you read it.

Instead of doing anything so obvious, Mr. Waring and Mr. Teller discuss the fundamental problems—social, economic, agronomic, and political—which beset the great majority of American farmers, the men and women who operate the country's "family-size" farms—the men and women who have roots in the earth because they love their land.

They discuss these problems, and their causes and effects, with frank particularity, and tell what they think is necessary to solve the problems. Because these authors are farmers, and therefore know from hard experience what they are writing about, what they say has the solid sound of fact rather than the hollow note of theory.

That is why the book kept me wide awake in the middle of the night—it has a ring of sincerity and urgency. Often it leaves one with a warm glow of indignation—either with or against the authors, depending on one's individual point of view on the matters under discussion.

On the subject of soil conservation, ROOTS IN THE EARTH is sound, as might be expected from writers who are also practical conservationists themselves. The subject is discussed innumerable times in several different chapters and in connection with many of the farmer's problems. Chapter VII, "Six Farmers on an Upland Stream," is practically a word-for-word reprint of a bulletin Mr. Waring wrote for the Soil Conservation Service, "Teamwork to Save Soil and Increase Production." Many conservation-mi[nded] readers will cheer the authors' specific recommendation [th]a[t] "Total conservation should be undertaken and the Soil [Con]servation Service expanded to meet the requirements of [th]i[s] vital work."

Mr. Waring and Mr. Teller profess to have "no bluepri[nt] for the agriculture of the future," but they leave the re[ader] with a pretty clear idea of what will have to be done. A[t] times they paint a dark picture, but they point out the [w]a[y] to the ultimate achievement of the goal, a sound, producti[ve] and permanent agriculture that will give the great arm[y] o[f] American live-on-the-farm farmers a chance at a de[cent] life.

And they cite with conviction increasing evidences [th]a[t] this body of rural citizens, with the help of education [an]d cooperation, is moving slowly but steadily toward that [w]ay.

This book is not for farmers alone, although its prim[ary] message is to them. It is a book for all Americans [w]h[o] want America to move forward instead of backward, [an]d become a better place for people to live in.

—William Clayton Fo[...]

(*Continued from page 185*)

seed situation. Much of the credit for such prog[ress] should go to the committee's able chairman, C. R. Enlow. Already developed is a proposal for the [l]a[rge] emergency production of improved grass and leg[ume] seeds, a proposal which was presented to the Inter-national Crop Improvement Association in Chicago on November 30. The fact that this association re-ported favorably on the committee's proposal for in-crease of foundation stocks of improved grass and legume seed speaks well not only for the ad[v]ance progress being made but also for the fine relationship that is being built with the agencies sponsoring the production of high quality seed.

The committee has also made recommendation o[n] price support for State certified seed of varieties and strains of alfalfa, red clover, sweetclover, and timothy. It has, too, made detailed recommendations regarding the export, import, and allocation of present seed stocks. This collaborative work of all the technical agencies dealing with the productio[n] of forage crop seeds should continue to be of great importance to the National seed production and dis-tribution scheme, not only during the present war period, but also, and increasingly, during the [p]ost-war period.

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Compiled by ETTA G. ROGERS, Publications Unit

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Bully beef for fighting men! A familiar scene these crisp winter days on the great stock farms of the West and Middle West. Here, in the protection of an eye-pleasing windbreak, hungry Herefords are getting their ensilage rations on the ranch of D. A. Pyle, Liberal, Kans. (Photographer unknown.)

MARCH 1944

SOIL CONSERVATION

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UNITED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

Contents

WELLINGTON BRINK
EDITOR

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MILKWEED FLOSS for the NAVY

By HARRY A. GUNNING

The substitution of milkweed floss for kapok is only one of the many examples of American ingenuity occasioned by war's necessities. We are proud of the fact that the Soil Conservation Service has been asked to assist in this project. Mr. Gunning heads up the Soil Conservation Service phase of the milkweed-floss assignment. He is Chief of the Nursery Division, Washington, D. C.—THE EDITOR.

With thousands of ocean-going vessels in constant use moving supplies, men, and ammunition to all parts of the world, with naval ships engaging the enemy in the broad expanse of the South Pacific and the Arctic, with submarine warfare in all oceans of the world, and our airplanes moving across large bodies of water to attack enemy posts, each and every man aboard must be provided with the best possible type of life jacket, life preserver, or life raft. Now, a landlubber from the plant world is going to sea as the latest addition to this important rescue squad. Milkweed floss has been tested and found a seaworthy replacement for kapok, long recognized as the most desirable material for the comfortable and widely used "Mae West" life jacket.

At the time of our entry into the war with Japan our supplies of Java kapok were substantial. When importation from Java was halted, allocation of reserve stocks was necessarily restricted to the manufacturer of items essential to the war effort. In the meantime, it was determined that floss from the common milkweed, *Asclepias syriaca*, was equal to kapok and even superior in some particulars. Kapok is a fiber obtained from the seed pod of the *Ceiba pentandra* tree of the tropics. The Ceiba tree is found in Central and South America, Africa, India, and many of the South Sea Islands. Ordinarily, the United States imports some 20 million pounds of kapok annually, chiefly from Java of the Dutch East Indies. In addition to its use in life preservers, it is a material in great demand by furniture, mattress, and pillow manufacturers. The Dutch in Java have developed kapok by plantation management and by improved separation methods into a very superior article especially valuable for flotation purposes. Kapok from other sources generally falls short of specifications in this respect.

Appreciating the increasing seriousness of the kapok situation as the war continued, the War Production Board, with the support of the Army, Navy, Coast Guard, and Air Corps, began to explore the possibilities of supplementing their requirements for buoyant fibers from the native milkweed. The U. S. Department of Agriculture was asked to advise the War Production Board as to the possibilities of milkweed floss collection in the United States. Information assembled by the various Bureaus and by private interests indicated that the common milkweed plant was very prevalent in Michigan, Wisconsin, Minnesota, Indiana, Illinois, Ohio, New York, and the New England States and in the aggregate produced a considerable quantity of floss each year. Thus

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1. Home drying in garage. Fences may be used just as satisfactorily, and with less difficulty.

2. Milkweed pods on way to processing plant.

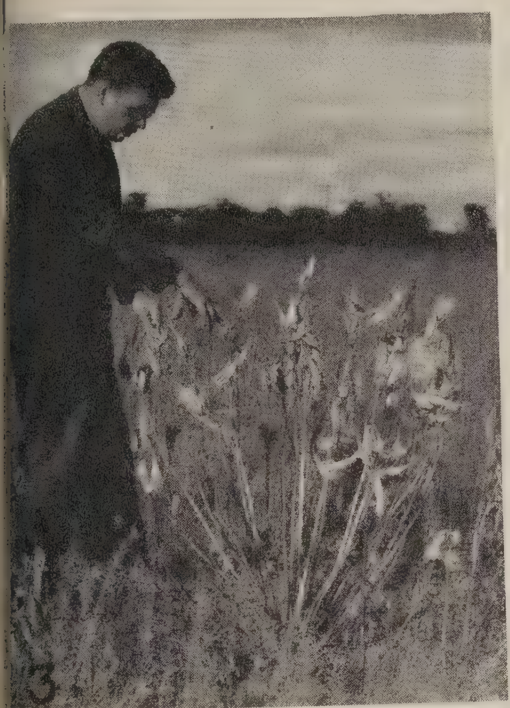
3. Typical of occurrence on stump pasture lands in northwestern Michigan. This picture, made in midsummer 1942, shows growth on fine sandy loam in Emmet County.

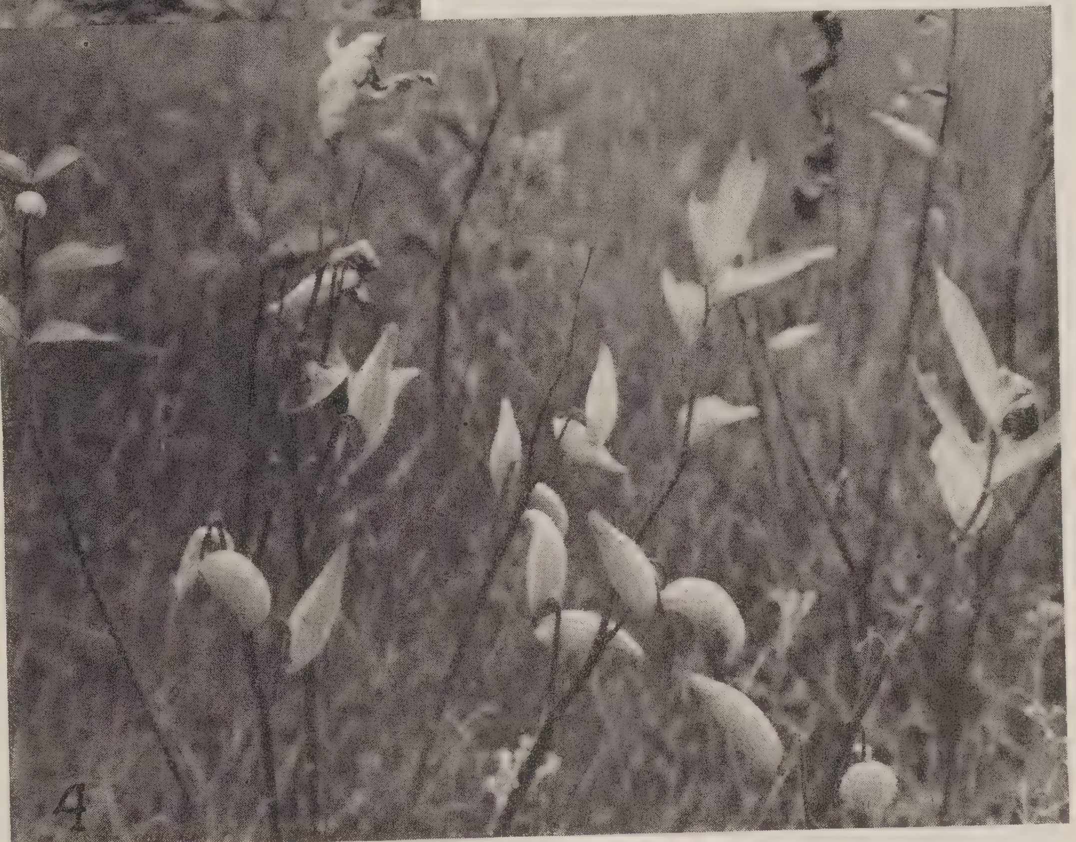
4. Natural stand as it is seen along roadsides in Charlevoix County.

encouraged, the War Production Board asked that War Food Administration undertake a 3-year program having as its objective the accumulation of a 10-million-pound stock pile of milkweed floss.

War Food Administration assigned the program to the Commodity Credit Corporation, which in turn requested the Soil Conservation Service to provide technical and physical direction. Two things were made clear to the War Production Board—first, that it was impossible to anticipate with any degree of accuracy the ultimate cost of collecting milkweed floss; second, that it was very difficult to estimate the amount of floss produced annually by native milkweed plants and how much of that floss could be collected through organized effort. The program, therefore, was to be entirely exploratory. In connection with the collection project the Defense Plant Corporation constructed a processing plant at Peto key, Mich., designed to separate the floss from po and seed.

Not until August was the Commodity Credit Co poration formally authorized to proceed. As pic ing operations must start by the middle





September, the time was short. While the range of the common milkweed includes almost the entire northern half of the United States, its abundance in any given location was completely unknown except for a few counties in northwest Michigan. Of necessity, therefore, the 1943 program was centered around Petoskey, Mich., with the hope that other concentrated areas might soon be found which would lend themselves to organized collection. It was planned, however, to place almost the entire dependence of the current season's operations upon the potential output of the northwest Michigan area.

This area includes the 15 counties bounded on the south by Mason, Lake, and Osceola Counties, on the east by Messaukee, Crawford, Otsego, and Cheboygan Counties, and on the west by Lake Michigan. Here the milkweed plant occurs in relative abundance on

1. Milkweed (*Asclepias syriaca*) 2 years from seed; planted by Soil Conservation Service on Research Center, Beltsville, Md. Due to drought, pod production in second year was very light; will produce maximum yield in third year.

2. Soil Conservation Service, Bureau of Plant Industry, and State agricultural experiment station men inspecting milkweed conditions in Emmet County, Mich.

3. An unusually productive individual plant.

4. Close-up of natural stand in northern Michigan. Ready for picking.

the sandy, well drained soils of the abandoned fields, pastures, roadsides, and waste areas. Rather hurried surveys made in 1942 indicated that wild stands in Emmet County alone produce several hundred

thousands pounds of floss annually. While this is recognized as the best milkweed county in northwest Michigan, it is obvious that a very substantial quantity of floss is produced every year within 15 counties under consideration. Assuming these surveys to be reasonably accurate, it did not appear to be an impossible task to meet the request of the War Production Board to build up a substantial stock pile of floss within the 3-year period.

As those familiar with the milkweed plant know, the floss is a very elusive substance. As the plant approaches seasonal maturity the leaves drop, the stem gradually ceases to function and while the pods cling tenaciously to the stem, they lose moisture and shrivel until they split and release the floss and seed. The job on hand was to collect the pods before the floss was lost, dry them so as to retain the desired characteristics of the natural floss and deliver them to the processing plant in good condition for separation.

Several salient points in handling milkweed pods and floss were known and others, for want of factual information, were assumed. On the basis of dry weight, a milkweed pod was known to consist of 22 percent floss, 38.5 percent pod shell, and 39.5 percent seed. Therefore, if separation was perfect, an average of 700 pods would produce one pound of floss. Allowing for certain processing inefficiencies, it was determined that at least 800 pods would have to be collected for each pound of floss. Weight of pods varied greatly. At the beginning of the picking season, pods contained about 66⅔ percent moisture. Moisture content decreased rapidly as maturity advanced, making weight a variable factor. In some instances, 35 pods equaled 1 pound while in others it took 120 pods to make a pound. On an average, there were about 65 pods to the pound.

The difficulties entailed in handling such material were appreciated, and every effort was made to facilitate collection. Even under the best of conditions, the picking season would be all too short. Reason dictated that the collection of pods should not be started until some of the seeds were turning brown. Fifty-pound open mesh onion bags were supplied pickers, so as to avoid the necessity of transferring partially dried pods from one container to another. These onion bags were considered ideal because they would hold a reasonable quantity of pods and at the same time would permit rapid drying. The high moisture content of milkweed pods presented a serious hazard from heating and spoiling. They had to be handled properly. These onion bags have a capacity of 1 bushel, or from 600 to 800 pods. It was, therefore, decided that the unit of measure for milkweed pods would be a 50-poun onion bag, filled reasonably full. For each bag o freshly picked pods the project paid 15 cents; if hel and air-dried by the picker, 20 cents. Immediatel after picking, the bags of pods must be hung o fences in the open and permitted to dry. Thre weeks of reasonably favorable weather would remov sufficient moisture to permit shipment to the process ing plant.

Drying bags of pods after collection was not at tractive to many persons; not everyone had the neces sary facilities to do the job or the desire to bothe with that part of it. Wrongly handled, the gree pods will heat and spoil very quickly. As a matte of fact, the process is not too exacting; it can be ac complished without much trouble, and with practi cally no danger of loss, by following a few simpl directions. The newness of the program, howeve suggested that insofar as possible plans be made t relieve the picker of this responsibility.

It was also appreciated that immediate cash pay ment for pods would be imperative. The problem was solved by operating through War Hemp Indus tries, Inc., of Chicago, a private corporation estab lished by the Commodity Credit Corporation for th purpose of facilitating the Government's hemp fibe program. War Hemp Industries, Inc., could mak cash payment for all milkweed pods delivered. The could also handle all fiscal transactions of the collec tion program. Funds for the program, therefor were assigned to War Hemp Industries, Inc., bu management and direction were retained by the Com modity Credit Corporation assisted by the So Conservation Service.

The pickers of milkweed pods were expected to b the men, women, and children of the farms. Som participation, too, was anticipated of residents o small towns but it was believed that this would defi nitely be limited because of transportation difficu ties. The peak of the pod harvesting season woul normally occur after the haying season and befo corn and potato harvest, not normally interferin with normal farm operations. As it happened, how ever, the current season's irregularities of rainfa and frost did result in some competition with th potato harvest.

The 1943 season in northwest Michigan was ab normal in several ways. The late summer and earl fall were exceedingly dry, causing a serious defi ciency of soil moisture. Milkweed pod productio was quite generally conceded to be materially les than the year before and below the average for th past several years. An unusually early killing fros on September 10 hastened maturity of the pods an

some locations caused damage to the floss. These rcumstances, together with continued dry, windy ll weather, shortened the collecting season from an ticipated 5- or 6-week period to one of about 3 eeks.

The 15 counties of northwest Michigan were di- ded into 10 collecting areas. A local man was nployed to represent the project in each area. He as instructed to find the milkweed fields in his rea, to stimulate and encourage collection through rmers, organizations and schools, and to establish nters where empty bags could be obtained by pick- s and filled bags of pods delivered. These men ere designated disbursing agents of War Hemp ndustries, Inc., and were provided with bank ac- ount. Each was required to establish a satisfactory umber of buying centers within his area to provide ready market for all pods collected. He was to dvance funds to each buying center as needed. In rder to handle the fresh pod purchase program a rying yard was established in each of the areas. rucks made daily or twice-weekly pick-up trips to ach of the buying centers, delivering pods to the rying yards where they were immediately hung on ences in the open. In most instances, these drying ards were county fair grounds. In some instances rying yards consisted of well-braced barbed wire ences constructed for the purpose.

Milkweed pod picking was undertaken enthusiasti- ally by a very large number of persons. The re- ults, however, were in direct proportion to the bility to organize an area, provide adequate infor- nation, and supply picking bags. Because of the ate start, many of the best areas were not able to unction until well past the middle of the picking eason. In good milkweed stands, individuals icked from three to six or more bags of pods per hour. Forty and fifty bags per day were not unusual, and a few instances were noted in which the pickers earned as much as $1.50 per hour.

Yields varied greatly, as might be expected. Emmet County had approximately 7,000 acres in milkweed. Of this acreage, 350 were classified as good, yielding 38 bags per acre; 1,800 acres medium, yielding 23 bags per acre; 2,700 acres fair, yielding 12 bags per acre; and 2,200 acres poor, yielding 4 bags per acre. The highest yielding field found during the 1943 program produced 80 bags of pods per acre. Harvesting ran in proportion to yield. About 90 percent of the high producing fields were harvested, while only 10 percent of the fair and poor fields were picked. In the aggregate, it was estimated that the season's harvest constituted about 50 percent of the available milkweed pods in Emmet County and from 15 to 25 percent of the production in the other 14 counties of northwest Michigan.

Picking had not progressed very far before we realized it would be impossible to obtain a very great quantity of milkweed floss in northwest Michigan. In the preceding year, there had been a general exodus of the population from this part of the State, estimated to be approximately 25 percent. We immediately began to explore the possibilities of extending our program more widely. Hurried surveys were made covering the entire State of Michigan, a large portion of Wisconsin, and parts of Ohio, New York, Maine, and Massachusetts. Large areas were found where milkweed occurs as a very common plant and in the aggregate might supply substantial quantities of floss, but in no instance did the quantity justify a program similar to that undertaken in northwest Michigan. As Michigan offered as good prospects as any other State, it was decided, because of the lateness of the season, to concentrate the greatest efforts there. Working through the State board of education, the cooperation of the county commissioner of education was obtained. The schools were requested to act as a distribution point for sacks, to encourage the pupils to collect pods, and to assemble the bags of air-dried pods at the school where they could be picked up and the pickers paid. County agricultural agents, county war boards, 4-H Club leaders, American Legion posts and Boy Scout troops all lent a hand.

The results of this effort were not too discouraging, considering the extremely late start. Over 50 counties in Michigan participated in 1943. Ottawa County, with 893 bags of pods, led all others, even though this county did not appear to have a great deal of milkweed. Information and empty bags were supplied to perhaps one-third of the schools of the county, and these schools were able to collect an average of about 15 bags per school. Michigan's school children accounted for the collection of approximately 12,000 bags of pods. It was quite evident that this was only a small percentage of the total production.

As intimated, 1943's collection was somewhat disappointing. We had hoped to obtain as much as 1,000,000 pounds of floss, but the actual figures totaled only some 150,000 pounds. Nearly all of this came from the State of Michigan, with but small quantities being supplied from Utah, Wisconsin, Indiana, Ohio, Maryland, and New Jersey. Better luck in another year is hoped for from the weather and from the ironing out of labor and transportation difficulties.

The need of a buoyant fiber to replace kapok increases as the war with Japan continues. Milkweed floss is at present the only known satisfactory replacement. Consideration is being given to the necessity and desirability of seeding and growing sufficient acreage of milkweed to produce our requirements of floss. Unfortunately, *Asclepias syriaca* is a perennial and will produce no crop the first year from seeding, only a light crop the second, it attains full production the third year. Furthermore, not a great deal is known about the culture of milkweeds and estimates only of potential floss production are available.

In the early 1920's a small amount of experimental work was conducted at Ames, Iowa. Later, the Russians and Canadians conducted some studies, of which we have only fragmentary knowledge. Seemingly, culture of milkweed is not too difficult and good stands would probably produce from 100 to 400 pounds of floss per acre yearly, beginning the second year after seeding. Soil texture, moisture, and rainfall, soil fertility, hydrogen content, cultural practices, and climate—all would have an important bearing. The fact that under normal conditions kapok can be delivered to New York at 10 cents per pound and that milkweed has always been considered a noxious weed and that eradication might eventually be a necessity if it were to be grown as a crop, places present emphasis on an effort to obtain our needs from natural stands of the pla rather than resort to its cultivation.

Knowledge of the natural distribution of mil weed within the United States indicates that it possible to obtain from 1 to 2 million pounds floss annually. The experience of the past seas shows that its collection can best be accomplish through the efforts of school children. Plans f 1944 are being prepared accordingly. Collectio will be organized through New England, New Yor Pennsylvania, Ohio, Illinois, Missouri, Iowa, Wi consin, and Minnesota. The work will be conduct in cooperation with the Extension Service, the W Boards, and the public school systems.

The program gives every school-age child an o portunity to participate in the war effort. It is worthy and appealing contribution. A continui and increasing shortage of buoyant fiber for t manufacturing of life jackets could very serious affect morale. It is enough to risk lives on the battl fields without exposing the fighting forces to u necessary hazards en route. Only the best and mo satisfactory materials should go into the life jacket life preservers, and life rafts supplied for the pr tection of soldiers, sailors, and marines. Two mi lion pounds of milkweed floss will make 1,200,0 "Mae West" jackets. That is not too many for t job at hand, but a quantity that will go a long w toward fulfilling this important need.

HE PUT A BLANKET ON HIS ORCHARD

By FRANK B. HARPER and GLENN E. PAXTON

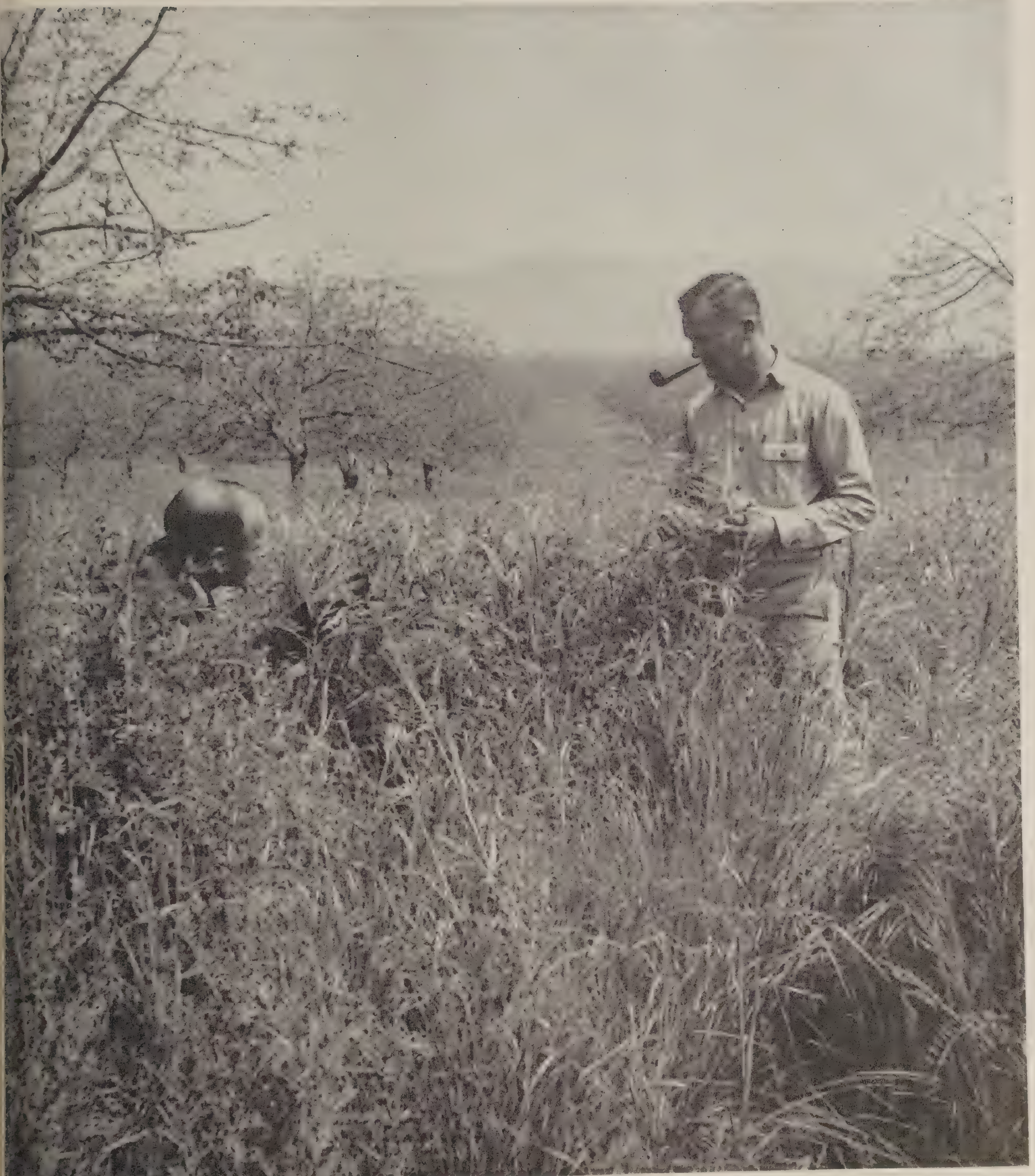
Vanasek works in his specially prepared Victory garden alongside his cover-cropped walnut orchard.

EDITOR'S NOTE.—Mr Harper is of the Division of Information, Pacific Coast Region, Portland, Oreg. Mr. Paxton is District Conservationist, Walnut Creek, Calif.

Several years ago an annual orchard cover cr sold itself to Tomas S. Vanasek, 2 miles northea of Walnut Creek, Calif., when it stopped so erosion and cut off two-thirds of the yearly sprin disking bill. At the same time, this cover cr restored Vanasek's 25 acres of English walnuts good producing condition.

Vanasek, who since has become secretary of t board of directors of the Contra Costa Soil Co servation District, admits he became the momenta object of neighborhood humor when he first bro away from the kind of clean cultivation that wor the orchard floor down to billard-table smoothne by numerous spring diskings. But he has satisfa tion enough today, not only in his own success, b also in the fact that cover crops are doing a sim larly effective job on some 3,000 acres of orchar in the district.

Vanasek bought the ranch in 1925. He recal that he then encountered gullies 18 inches deep a



nnual cover crops such as this one—1943—in Tomas Vanasek's walnut orchard 2 miles northeast of Walnut Creek, Calif., ave stopped soil washing, improved condition of trees and quality of nuts, and cut spring tillage costs. Vanasek is at right; Joe Rogers, district work unit leader, at left.

feet wide, where earlier operators had run a subsoiler downhill to get water into the soil. In 1926, e said, he disked the ground a half-dozen times or o to kill out native mustard, miner's lettuce and uch, "hitching up, and disking the whole orchard if there were even just a few sprigs showings."

His orchard still drew compliments on its neat appearance, but—

"The cover got shorter and shorter, until the ground was bare; and when the rains came, the water

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ran off down every wheel track. The quality of the nuts decreased."

Though he did not pretend to know much about soil erosion then, Vanasek and some of his neighbors got together and did the best they could trying to make contour ditches of their own design carry off the runoff without breaking over and washing at the outlets. About 1938, he picked up a suggestion at a Farm Bureau meeting that he take a trip with Farm Advisor Roy Goble of the Extension Service over to Watsonville to look at orchard erosion control work being done there with the assistance of the Soil Conservation Service. Back home, local Service men helped him seed a cover crop of barley, peas, and vetch in the fall. Vanasek got a pretty good barley stand, he says, and the next spring went over it just twice with the disk and did not do any dragging, despite word that filtered back to him about his "sloppy farming." His trees as yet did not look too thrifty, and there were those who thought that his orchard was being ruined.

The Contra Costa walnut grower said he actually did plan once to disk, after all, but one thing and another fortunately kept him from getting at it. Though much of the erosion was stopped by this initial cover crop, water still came down onto the orchard from adjacent high ground. This prompted Vanasek and his neighbors to work out a "real" water-disposal and cover cropping plan, as a unit.

Between December and February of 1940–41 came rains 25 to 30 percent above normal—sometimes as much as an inch a day up to 4 days in a row.

"It was the worst winter we'd ever had," Vanasek reported. "I walked all over the orchard, and for the first time in its history I hadn't lost more than a 10- or 12-quart basketful of soil, contrasted to 50 to 250 tons of topsoil that went off before I went into cover cropping, trashy cover, and water-disposal ditches. And I haven't lost half a yard of soil since. You can't see any evidence whatever of erosion. We have measured 12 to 14 tons of green cover crops to the acre. That holds the water."

Pointing out that one farmer he knows used to go over his orchard eight or nine times but now has reduced his disking to four or five times and possibly will cut it to three, Vanasek said his own two-time disking, with an 8-foot disk and 30-horsepower tractor, is effective. The first time over, he said, kills about 90 percent of the vegetation, even when the disk rides on top half the time; then cross disking a couple of weeks later finishes the kill.

"Our walnuts at the huller, compared with the others, show up as well or better," he said of the nuts harvested by himself and cover-cropping neighbors. "My trees are holding their own now and the quality of the nuts is better. Meanwhile, we are building up the soil; you can pick up a clod and it is full of roots and crumbles up. Before, it was in an unproductive condition."

He was surprised to find that fewer nuts are lost when they drop onto a dry cover-crop mat that flattens down by September, explaining that they bounce and lie on top instead of "plunking" into the fine, loose soil as they once did, "like rain drops." He said that he and Mrs. Vanasek harvested virtually all of their walnuts themselves. On a subsequent spot check, they were able to find in 8 hours only a bucketful apiece of missed nuts under the trees, whereas they retrieved that many in less than an hour on neighboring clean ground.

Purple vetch, Canadian field peas and red oats comprise the bulk of Vanasek's cover crop mixture. It is broadcast 80 pounds to the acre before harvest, right on top of the preceding year's cover-crop mulch. It works its own way down into the soil and thus saves more labor and machinery. Vanasek put at $1.75 an acre, or $77 for two diskings of approximately 22 planted acres, today's cost of handling his walnut land, compared with between $200 and $250 formerly spent for half a dozen diskings in clean cultivating.

His other good land-use practices include annual ditches to carry off excess water, and winter feeding of several hundred birds—principally white crown sparrows, whose liking for his farm wildlife refuge he credits with keeping his trees insect free and saving him a $150 annual spraying bill.

"It's a great feeling," Vanasek says in summary, "to see the black clouds coming up and be able to say, 'Let 'er rain!' "

SAFETY RECORD AT NEW HIGH

For the first year in the history of the Soil Conservation Service's employee safety program, no accidental deaths occurred during 1943. This all-time record established during the past year is particularly enviable, considering the present rapid personnel turn-over and the necessary use of many hurriedly-trained, new employees.

Soil Conservation Service employees' lost time injuries have also been amazingly reduced. From a high of 28 injuries for every million hours worked in 1936 the rate was progressively reduced to a low of 7 injuries in 1943. This means many more workers available in 1943 to push Soil Conservation Service's job of increasing vital wartime food production.

WAN LUNG SHAN, WHERE CHINA'S HISTORY IS WRITTEN IN THE LAND

By WALTER C. LOWDERMILK

The author, who is Assistant Chief of the Soil Conservation Service, has recently returned from China where he spent a year as agricultural advisor to the Chunking Government.

former great gully in Hwan Lung Shan that was active ring period of intensive cultivation grew up with brush and trees after regional area was abandoned.

In the central part of Shensi Province, west of e Yellow River and east of the Loh, lies the Hwan ung Shan, or Yellow Dragon Mountains. This ea has played a strategic part in Chinese history, cause of its location and rugged character. It is id that whatever general held this rugged region as able to march from the west on to Peking. or that reason it has had a new significance in the efense of China against the Japanese; if held by hinese armies, it would flank any enemy thrust estward along the Wei River to Sian and beyond. his was a good strategic reason for garrisoning wan Lung Shan to defend China from further ivasion.

But Hwan Lung Shan was nearly empty of peole. It had not recovered from the ravages of the Iohammedan Rebellion some 70 to 80 years ago. t that time the villagers were destroyed, the peole dispersed, and the farmers driven off their land ntil this region was practically depopulated. hereafter it became a harbor for bandits. The uggedness of the topography made travel through he area slow and difficult and hindered occupation y farm people, especially since pioneers might beome victims of bandits that roamed and took refuge n the hills. Colonization of Hwan Lung Shan by refugees from occupied China was undertaken 5 years ago.

Physical features of this region have influenced its history. Hwan Lung Mountains are remnants of a former plateau made up of horizontal beds of alternative sandstones and shales. In past geologic time streams cut intricate patterns into this uplifted plateau, cutting deep valleys with steep slopes and leaving for the most part narrow ridges between. Ridges now stand from 5,000 to 6,000 feet above sea level. We saw ridge after ridge lying remarkably level and at about the same height off to the horizon on all sides. As we traveled from one place to another, we descended a steep slope, crossed a narrow alluvial valley, then ascended a steep slope on the other side. Sometimes, of course, our way followed up or down a valley. Travel by such trains in Hwan Lung Shan is slow. But highways are now being built throughout the region.

Another gully healed. No run-off now occurs. Complete vegetative cover demonstrates that present climate is satisfactory for a fully vegetated landscape.

The original rocks of the plateau are sandstone and beds of shale, alternating, still lying in a horizontal position. The plateau was uplifted and cut into a labyrinth of steep walled valleys before the Ice Age. The loess was deposited as a blanket over this rugged topography during the Ice Age not so thick as to fill in the pre-loess valleys, but to smooth them out. Field evidence indicates that the loess on the steep slopes was eroded during, as well as after, the period of its deposition, and relaid in valley floods. It has been completely removed from steep slopes. Remnants of the old loess blanket were left here and there in the valleys, on the

Hwan Lung Shan—an area with its history written in the land. Upper reaches of drainages were once forested, cultivated, abandoned, and now have grown back to grass or forest. Loess, if it existed on these slopes, has been eroded off.

gentler slopes, and on the wider ridge tops. Primary loess is the original wind-laid material; secondary loess, that which was reworked and water-laid in valleys as alluvium. Wherever the loess is found in sufficient depth, it makes excellent farm land except when lying at steep gradients.

While there is evidence of wide changes in climate from Ice-Age to the present, there is no conclusive evidence of important changes in climate during the past 2,000 years. No meteorological data have been kept. But historical records tell of famines due to drought or floods, inidcating a variability of rainfall that is normal to regions lying between humid and desert zones. Such variability characterizes Western America and the Near East. The physiographic record of the area shows a uniform cutting out of valleys, and would indicate no pronounced shifts in climate.

From natural vegetation rainfall is estimated at about 20 to 25 inches per annum, which falls mostly in summer. The region was originally covered with forest, with grasses on drier ridges and upper slopes. Forest species are pines (*Pinus tabulaformis*, *Pinus Bugeana*), *Sophora spp.*, maples, elm (*Ulmus pumila*), *Zelkova sinica*, and wild fruit trees of peach, pear, and apricot and poplars along streams. Shrub growth includes willows along streams, *Hypophaea*, hawthorne, lilac, honeysuckle, and lespedezas. Herbs and grasses, including wheat and blue grasses, grow on drier sites.

Topography and vegetation mark this as best suited to livestock and forest growing region. Alluvial valley lands and some plateau remnants of loessial soils can be farmed to supplement livestock and timber products.

The region shows the marks of serious misuse in the past. It has partly recovered, healed over by vegetation, since the area was abandoned except for a few isolated subsistence farmers in alluvial valleys. From what is written in the land we read the following record, in five stages.

The first stage dates back more than a century, when this picturesque region was occupied by a farming population that put high pressure upon the land. All the valley floors and the loess caps on the ridges were not only cultivated but the cultivation line was pushed up the slopes to steep gradients, even up to the ridges. Villages were located in large numbers both in the valleys and on the ridges, as we can now see in ruins. How long this period lasted we have no way of knowing without long research. The important fact is that cultivation had been spread to practically all plowable land.

The second stage overlapped the first.—During this there was a marked spread of soil erosion, especially on the slopes, as a result of clearing away the original dense cover and cultivating the slopes. Upper slopes became corrugated and lower slopes were cut with deep vertical-walled gullies. Much of the loess blanket on steeper slopes was removed in this stage, exposing underlying residual material from sandstones and shale. Erosion conditions must have been very serious, judging by marks in the land. Whether or not erosion had developed to this degree before abandonment, or how long it continued afterward, is difficult to know.

The third stage was one of almost complete abandonment by farmers.—This occurred, we are told, during the Mohammedan Rebellions that ravaged the region for some 10 years, between 1860 and 187[illegible]. Villages were destroyed and their populations killed or dispersed. These villages were not reoccupied and the region became the haunt of bandits.

In the fourth stage the region was healed of erosion by return of vegetation.—Grasses on hilltops and ridges, and brush and tree growth on lower slopes and wide ridges. Grasses spread over the corrugated upper slopes of the valleys, shrubs and trees grew up in the gullies and on the former fields until the whole surface was covered over with a complete mantle. This was of high significance because it clearly indicated that the present climate will support a vigorous cover of vegetation in this area if given an opportunity. The decline of the area cannot be ascribed to adverse change of climate. Some other cause must be found.

We took occasion to study in detail the vegetation of gullies that had healed. Listed below are the results of a sample plot taken in one of these gullies. The remarkable fact is that no runoff is taking place

nder the existing vegetative cover, whereas formerly here must have been a formidable flow sufficient to ut 50 feet deep and from 70 to 80 feet wide. We ound gully after gully so healed in the course of our urvey. Slopes and tops of broad, rounded ridges vere covered with dense stands of birch, aspen, naple, and oak.

We begin, here in Hwan Lung Shan, a demonstration of aying out fields on the exact contour; a bank channel to start a bench terrace. Farmers have come to see the demonstration, and are told objectives and methods of farming measures to save the rain that falls, to store it in the soil, to prevent runoff and erosion.

SAMPLE PLOT IN HEALED GULLY

East facing slope near Yao Hsien. Formerly cut in loess, 56 feet deep, 81 feet wide. Talus on each side covers floor to within 3 feet.

Trees

(Plot 30 feet in diameter laid out in gully):

$\frac{\textit{Salix}}{\text{(Willow)}}$ 4, $\frac{2''\text{–}8''}{6''}$ diameter breast high

$\frac{\textit{Betulas}}{\text{(Birch)}}$ 4, $\frac{2''\text{–}10''}{8''}$ diameter breast high—average 8 inches.

Undergrowth

Acer ginnala
Spiraea pubescens
Prunus sp.
Campylotropsis macrocarpa
Vicia sp.

Herbs and grasses

Carex sp.
Andropogon sp.
Polygonum sp.
Fragmilis communis

Where ridges between deep valleys are wide the loess blanket has persisted and makes excellent farming land. American corn or Indian maize is the mainstay crop of this colonization project in Hwan Lung Shan.

Forest litter of leaves and twigs—6 inches deep, decompositional contact with soil.

No run-off has occurred in this gully for several years, indicating that no erosion has occurred, and the gully is healed up.

Effects of healing of eroding slopes by vegetation was reflected in the regimen of streams. For the the streams were running clear over stones covered with moss that had not been dislodged for many years; willows and streamside vegetation were growing down to the very water's edge, showing that there was very little high stage of flow during the rainy season. The higher stages were not strong enough to wash out channels or to undercut vegetation. We had in these streams a perfect example of headwater control of stream flow, a remarkable fact in the loessial region.

These were evidences of a healing of a seriously eroded region resulting after abandonment. This was especially instructive to us in our study of the problems of the area.

The fifth stage is now in its beginning.—Hwan Lung Shan on the maps appeared to be without people, whereas in former times a considerable population had dwelt here. It was selected as a colonization area for refugees out of Honan and enemy-occupied China. Refugees were invited to come to this region and were assigned small farms where they may grow their food. They were to be exempt from taxes for a period and from military conscription. But they were to train for guerrilla tactics as a defense against the invader.

Valley floors were cleared and cultivated, the loessial cappings of border ridges as well, but now formerly fields on slopes are being cleared again and cultivated to food crops. Clearing slopes again

has set in motion the beginning of another cycle of accelerated erosion. We were called in to advise on suggestions for development of the region.

We talked to refugees, some on the trek, others that were settled on a piece of land where a remnant of the loess blanket stood as a cliff into which these people could hew out caves for a home for themselves and a stable for their work cow. One family, Mah by name, had fled because the Yellow River flooded and now flows over their land; 1 family, Wang, a fine group, now living in caves, are cultivating 7 acres of land to corn, potatoes, onions, and millet. They had fled the Japs who invaded the Hopeh area. The Wangs had had a big farm in Hopeh, with 100 pear trees, and were prosperous farmers. The old man and his wife were proud people. Their 3 stalwart sons were fine specimens of the determination of China to remain free. Another refugee family by the name of Li had stopped for lunch in the shade of trees beside a clear flowing stream and were making wheat and corn bread dough for their noon meal as we pased by. These were from Hupeh, where the Japs had invaded, and had fled the robberies and cruelties of the Japs to be free. It was the spirit of these people that moved me. I took pictures of many of the refugees, cheered them, wished them happiness and wealth and good luck, by saying "How Fu Chi." The Wang family invited us to have lunch, for which, of course, we paid them well. They gave us millet instead of rice, wild celery, the fresh green leaves of trees, onion tops, and boiled eggs. Chopsticks were cut from slender stems of bushes nearby. It was a good meal and a cheerful one. Hospitality of these proud people was very real, and dignified. There is a great story—a Good Earth story up to date in these refugees and their search for a way to live on. The dark, tragic, side of the story is that not hundreds, not thousands, but millions have died, many of starvation, many of diseases aided and abetted by malnutrition. This great drama of people fleeing the invader and seeking to find an adjustment to resources of the land is the most fascinating drama of reality. Uprooting of people, making them seek out new adjustments, only brings into bold relief the fundamental—the basic—the foundation factors of such adjustments that our complex society obscures from the general perception. If we are to establish peace, a constructive peace on earth, we must understand how the mechanism of civilization works and see that this mechanism is well constructed and well tended.

After making a study of the area, we put in at Si Pu a demonstration of conservation measures for the farmers of the neighborhood to see. The villag itself lies in the valley along the stream. But th best farming land is up on the remnant of the ol plateau, which near here has not been cut into b stream erosion. This plateau remnant is covere with a blanket of loess which makes it fertile farm ing land. One of my men, Tsiang Teh Chih, ha surveyed this area some 10 years ago to make a re port on its possibilities for colonization. He told m that then he had found this tract in tall grass wit a scattering of wild pear trees. But now the entir area had been cleared and was cultivated to cor and potatoes. Already the heavy rains had begun t course across the gentle slopes and to erode the soi into shallow rills. Considerable streams of storm run-off had accumulated from the larger fields an poured off again into the heads of healed up gullie dating back to the former period of accelerated ero sion. Here was a chance to put conservation int farming of this area.

Farmers in this area had come principally fro Honan. They were not at all accustomed to farmin sloping land, for the great delta of the Yello River at Honan is practically level. Their rows wer straight and they took no account of topograph or of contour farming. Our first measure, then, wa to begin to lay out fields on exact contours, beginnin on the gently sloping divides on the remnant of th plateau. We had made our plans a few days befor had made A frames and V drags, and had assemble plows and surveying instruments to lay out the field on the contour, to build broad-base terraces and t sow strip crops to show the farmers what we wer driving at.

When all was in readiness, we followed the stee trail out of the valley on to the plateau and came t our location. As we began to plan fields and t stake off our contour lines farmers began to gathe Soon we had 75 to 80 farmers to see what we wer doing. Each member of my party had his task Engineers laid out lines, and the agronomist talke to the farmers. While we were plowing a terrac location and using the V drag we noticed a cloud o dust off in the distance. Presently we could see great crowd of people coming. They appeared to b in a hurry. Soon fully 300 farmers came to see ou demonstration. They watched as we put in the meas ures to absorb more of the rain and to reduce th run-off and erosion, and answered questions of ou agronomist.

Director Hu of the colonization project was anx ious that farmers pay close attention and becam thoroughly acquainted with our work. For he de clared his intention that rules for farming the lan

assigned to refugees should follow the principles of conservation.

In this region we found an excellent set-up for an experimental demonstration to include complete drainage. The upper portions of the drainage would be a part of the plateau loess cap and a great gully which had eaten back into it in the second or erosion stage. At present this great gully is filled with trees and furnishes an excellent woodlot to supply fuel and timber for nearby villages. Some portion of the gully floor must be built up by means of a soil-saving dam to catch silt that erodes from the drainage before a complete program of conservation measures can fully check erosion. This alluvium will make additional land for farm fields. Intermediate slopes of the gully are now covered with brush but may be partially cleared and reseeded to grasses for excellent pasture.

In this area we had the opportunity to establish an experimental demonstration project wherein we may classify the land according to its highest sustained uses and develop each class for farm crops, forage cover for livestock and woodlots to supply the local people with livestock, timber and food products. We recommended that this tract be set aside for a large experimental demonstration to represent the problem area of the Lo Ho drainage. Since land is not yet deeded to refugees, it is possible here to rearrange field and farm boundaries to fit into a program of conservation treatment of all classes of the area's land.

As Indian maize, a New World crop, was the food crop of our pioneers of America, so is corn the food crop of these pioneer colonies in Hwan Lung Shan. Corn, potatoes, and hemp are the principal crops grown. The region is a bit too high for winter wheat. Oats or spring wheat or buckwheat may be grown and the people from Honan prefer wheat, but thus far corn has proved to be the most easily planted and tended, and gives the largest returns to the farmers.

As we left our demonstrations we passed many refugees along the trail. I was touched by the greeting of one farmer, Ko, whom I recognized as one who had taken part in our demonstration of the day before. He was most sincere and eager that I get off my horse and have breakfast with him; he wanted to talk to me. I apologized by saying that I spoke Chinese poorly. In reply he said, "You speak very well," and was very insistent on my getting down to have breakfast with him. But Director Hu said that we must be going on to reach our lodging for the night. Along the way farmers were clearing land now in brush, grass, or trees. More of this was being done along the broad ridge than I had seen elsewhere. Beside the trail were fields already planted to corn, potatoes, hemp, and buckwheat.

All along the way were old gullies, now healed up but bearing marks of devastating erosion of some time in the past before the region was abandoned. We passed on to a divide along a high broad ridge. From this divide we got magnificent views out toward the deeply dissected country to the east, that went from green foreground to blue on the horizon. I took colored photographs, but people will be hard to convince that this, too, is China. Guards saluted us all along the way.

At our headquarters on the morning of our departure I was invited to speak to a great crowd of farmers, most of whom had been standing there since 6 o'clock in the morning. Each farmer had a paper flag in red with characters written on it and these they waved in applause. They listened with attention to what I had to say as it was interpreted to them in Chinese, for my Chinese is not good enough for making a speech. As we drove away, farmers stood on each side of the road for more than half a mile and cheered and waved their flags to send us off.

We had spent 16 days in a region the like of which I had never seen before in China, a region which bears a record in the land that we found not only interesting but instructive, as well, in indicating measures that should be recommended for improving the use and productivity of this strategic area of Free China. Most important of all, we had found evidence that decline of this region, as shown by ruins of abandoned villages, was due to misuse of the land rather than a climatic change. Such misuse may have brought on social disturbances that ended in the Mohammed Rebellion. Moreover, prevailing climate is favorable to healing land wounds of erosion and to conservation use of this picturesque and strategic area of north China.

For almost a year, the Service has been engaged in a survey and analysis of the soil and water conservation needs of the Nation. This undertaking, which is now nearing completion, will provide a factual, physical analysis of the land resources of the country, indicating what conservation measures need to be applied, and to what extent, if we are to achieve maximum efficiency and full productive use of our soil wealth.

BLITZING THE BRUSH IN FLORIDA

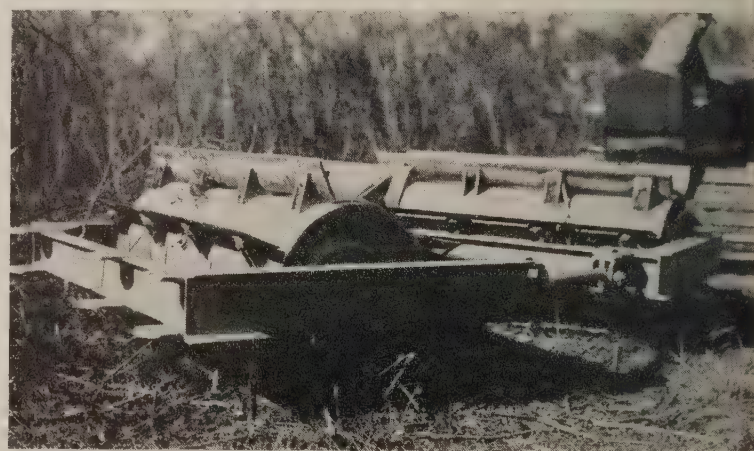
Three-unit machines pile up the weed-free acreage as wheel-type tractors romp along in high gear. Five- and seven-unit machines of the same type cut acres in astronomical figures, as compared with other and older ways of eliminating weeds.

By J. E. WILLIAMS

From Florida, a State with nearly a million head of cattle, comes a machine designed especially for the establishment and maintenance of pastures. The term "establishment" includes the eradication of brush and other undesirable growth, together with the preparation of a seedbed suitable for planting grass seed in one operation. "Maintenance" has to do with the elimination of weeds, which are sure to follow the planting of grasses, the elimination of any sprouts which might come up from the previous foreign growth, and a mild cultivation of the newly planted grassland.

The largest of the machines comprises two units, each 7 feet wide and weighing 4,500 pounds. The machine is a hollow steel drum around which are bolted blades much in the manner of the old stalk cutter. This drum is filled with water, which approximately doubles the weight and brings the 2-unit machine of this size to 18,000 pounds. Maximum cutting ability is obtained through hitching the 2-units in tandem, with a semirigid connecting link forcing the rear unit to follow the first at an oblique angle. Operated in this way, this large machine very effectively cuts brush, palmetto, bay, oak, and pine. The action is such that the rubbish is cut *into* the soil without inversion. In other words, the fertile topsoil is left in place and in such condition that grass seed can be planted without further operations.

This largest of the machines requires considerable power, though not as much as might be anticipated. Crawler type tractors of the medium range of horsepower are sufficient. A slightly smaller machine,



A large version of the cutter, hitched so that the two section[s] are in tandem. Known as a "light brush cutter," it make[s] short work of brush such as that shown in background. [A] still heavier machine of identical type weighs 9,000 pound[s] and will cut pine trees up to 5 inches in diameter. Foreig[n] matter is cut into the soil, leaving a seed bed ready fo[r] planting.

having units of 5-foot spread instead of 7, are handle[d] with ease by tractors of the WD–40 or TD–40 class or by Caterpillar RD–4's.

On pre-war basis of availability of grass see[d] and other conditions, land could be prepared an[d] planted for an average of $5.00 per acre. Where th[e] foreign growth was not so heavy the cost might b[e] considerably less.

Much of Florida's range land consists of vast prai[ri]ries, free of timber and sodded with the native carpe[t] grass growing either naturally or as a result of havin[g] been planted following the removal of palmetto. Here, weed control is the problem. Mowing is calculated by the Florida rancher as too slow and to[o] expensive. Hence the cutter has been adapted fo[r] the work. A much smaller machine of the same typ[e] is used, only that each individual unit is hitched s[o] that it follows parallel to, and at an off-set, to the lea[d]

(*Continued on page 213*)

EDITOR'S NOTE.—The author is co-owner of the Crescent Valley ranch, Davenport, Fla., with his father, P. E. Williams. Williams, Sr., is president of the State Cattleman's Assn.

SNEAKING UP ON WEEDS

, RICHARD M. BOND AND PAUL M. SCHEFFER

Weeds are familiar saboteurs of war food pro-
:ction that invite soil conservationists to draw upon eir best land use improvement techniques to help th a problem that is annoying and wasteful at any ne.

When weed-infested lands are added up—from tches of morning glory the size of a hat to whole lds or entire farms gone back to sunflowers, rag-
eeds, and the like—there is a vast area producing othing but weeds, and an even greater acreage that is so many weeds mixed with crops that both pro-
iction and quality are lowered. Even without a ar, weeds are no help to the farmer who is trying make a living from his land. Rather, they are o often associated with "run down" land, over-
azed ranges, eroded hillsides, or other results of nproper land use.

Although weeds, like beneficial plants, grow best rich soil with favorable climate and moisture, nder these conditions the crop plants are usually ble to crowd out most of the weeds, whereas in poor raw soil low in plant nutrients and organic matter ie weeds do much better than the crop plants.

Of course, there are many places where sagebrush cactus or Russian thistles or sunflowers have layed an important part in holding misused soil ntil better plants have been re-established, but some-
mes conditions on a piece of land get so bad that ven weeds cannot take it.

Wesley Cornwall, chairman of the board of super-
isors of the Latah Rock Creek Soil Conservation District in eastern Washington, remarked last fall discounting dry-pea farmers' excuses for burning heir straw because that "would destroy weed seed." There are just two answers to this weed question—
ou either have to build up the fertility of your soil ntil you get good crops and also weeds; or let the and run down till you don't raise either one." Even hough peas do not compete with weeds as well as nost other crops do, it was noted that right in Mr. Cornwall's neighborhood fertile soil in peas actually harbored fewer weeds than run-down soil, although he difference was not so marked as to catch Mr. Cornwall's eye. He was watching the peas, and here is no question that fertile soil produced more f them.

Probably the weed problem is not at its worst in

Two irrigation ditches in Yakima Valley, eastern Washington. One has its banks covered with whitetop, the roots of which push out many feet into the fields each year and the seed of which is shed into the irrigation water. Banks of the other ditch have been planted to perennial grasses, and the whitetop that was there too has been so thoroughly suppressed that it does not show in the picture and is no longer a serious pest. The grass provides useful forage.

any particular place, but it is certainly extremely serious in many parts of the Pacific Coast Region, especially in many of the irrigated valleys where hot, sunny weather and ample moisture promote luxuriant growth of crops and weeds alike, and where the weeds are so widely distributed that complete eradication appears hopeless. Because of the need for wartime farm production, and because it is so intimately associated with good land use, the weed problem is receiving much attention from Soil Conservation Service biologists, agronomists, and range men. Field observation on various methods of land management have been valuable, and State publications contain material that can be adapted directly to fit into the soil conservation program. The ultimate aim is to gather together the facts about each type of weed, each kind of agriculture, and each class of soil and climate. Eventually it is hoped to develop for each soil conservation district a set of simple job sheets for weed control by management exactly fitted to local conditions. This already has been done on the Wenas District in central Washington.

Weeds do not grow on a farm because they are naturally mean, nor because they are in the pay of the Axis. An Oregon oat field full of Canada thistle or a Missouri meadow full of daisies is not that way

EDITOR'S NOTE.—The authors are, respectively, chief regional iology division, Portland, Oreg., and associate biologist, Yakima, Vash.

Two irrigated ladino clover pastures in the Sacramento Valley, Calif. The cow pasture has been regularly clipped and is free of weeds. The sheep pasture has not been clipped and the weeds are getting ahead of the clover. Forage production in the weedy pasture has been lowered by an important amount.

because "somebody introduced the seed" into the area. Those particular weeds would not have been there if their seed had not been introduced, but there would be other weeds just about as bad.

Weeds grow where they do for a very simple reason that is not widely known. It is because they are the plants among those available that are best suited to succeed under the particular climatic, soil or other conditions present. In other words, the hayfield is full of daisies because conditions there are better for daisies than they are for clover, timothy or whatever the farmer is trying to grow.

It may be because they get so angry at them that many farmers try to get rid of their weeds by means of a violent frontal attack—2 or even 3 years of clean cultivation, or 5 pounds of chlorate to the square rod, or even by burning with a torch. Yet some thought and observation will show that, in a great many cases, it is much better to sneak up on the weeds and take them from the rear.

"Direct" weed control of various kinds has killed its share of weeds, it is true; but direct methods have a number of drawbacks. They are expensive, they usually take the land out of production for several years, and they must be used with great care or they are worthless. Many a time the missing of one cultivation has set the weed control program back a whole year. But worst of all, the soil usually is left in poor condition for crops, and in virtually perfect condition for the weed to move right back in and take over the place. This is especially likely to happ[en] when the farmer resumes his old farming metho[ds] which encouraged the weeds in the first place, and [if] the weed in question has been established a long tim[e,] is on the neighboring farms, and already has seeds [in] the soil that will sprout for years to come.

Sneaking up on the weeds, however, is practicab[le] in almost all parts of the country. On every sort [of] land there are one or more factors of environme[nt] that can be changed so that conditions can be made [more] favorable for various valuable plants that weeds ca[n]not compete successfully.

One of the most widely effective weed contr[ol] methods is a crop rotation that includes a gre[en] manure crop. People usually do not think of th[is] as a weed control practice—but just compare t[he] weeds in one-crop land and in adjacent land und[er] a good rotation. In a one-crop system, any plant th[at] sprouts a little later than the crop and matures [a] little earlier is an especially dangerous potenti[al] weed, and such plants tend to become more and mo[re] abundant as the years in a single crop go on.

A series of different crops, seeded and harvested [at] different times of the year, does not allow any su[ch] weed population to build up. Furthermore, wee[ds] are usually worst in land of low fertility, simply b[e]cause many of them are able to make better use of ve[ry] small amounts of plant nutrients than are most cro[ps]. A green manure crop increases the supply of pla[nt] food, and creates conditions under which crop pla[nts] grow more vigorously than do most weeds. Chem[i]cal fertilizers have a similar effect, but seemingly to [a] lesser degree, perhaps because the physical conditi[on] of the soil is improved by the added organic matt[er] but not by the chemicals. Again, many of our wor[st] weeds have coarse tap roots better adapted to grow[th] in soils low in organic matter than the finer, mo[re] fibrous roots of most of our crop plants.

Perennial grasses and legumes often will grow we[ll] where other crop plants grow poorly. It is better [to] have a good hay field than a field containing 90 pe[r]cent bindweed and only 10 percent potatoes.

Weeds in hay and pasture fields of legumes a[re] often a symptom of too much nitrogen for the avai[l]able phosphate, or of too little lime. Weeds in pa[s]tures of grass, or mainly grass, quickly becom[e] abundant if the pasture is misused. If the catt[le] are turned in when the ground is wet, the soil [is] compacted and the sod becomes cut and broken[—] the very conditions most suitable for maywee[d] (called dogfennel in the West) and many oth[er] weeds to get a good start. Grazing animals eat th[e] tastiest food they can find, and so take the fora[ge] plants and leave the weeds to grow. As the wee[ds]

:ow taller, they begin to shade out the pasture lants and thus make room for more weeds.

That is why so many farmers—though not enough f them—clip their pastures a couple of times a year. his treatment forces the weeds to compete on even rms with the grazed down grasses and clover, and roper fertilizing and proper grazing assures that ne weeds lose out under these conditions. Regular asture clipping is important everywhere, but especially so in areas that formerly were forested, beuse there brush and trees will quickly reoccupy the ind if they are allowed to do so. (Of course the asture plants have to be suited to the soil, moisture, nd climatic conditions—no amount of management ould keep weeds out of alfalfa seeded on land with high and fluctuating water table, for example.)

Road banks and field borders are liable to excessive eediness, and though their production of vast quanities of weed seeds is probably not so dangerous as sually thought, these seeds do not *help* the farmers eep the weeds out of his crop. More important s the fact that the weeds are worthless, and land n weeds is not providing anything for the farmer. Veeds grow in such places because the land there is specially subject to disturbance and erosion. There re not too many useful plants that can grow in such laces and keep the weeds out, but sericea lespedeza n the southeast and Ladak alfalfa with crested vheatgrass in the northwest will do it, and are doing t—and providing hay, pasture, erosion control, and vildlife food and cover, to boot.

In irrigated sections of the West, weeds often ake over the ditch banks and produce seeds which loat down the ditches and into the crop fields with he irrigation water. Those same ditch banks will upport excellent stands of harmless or even useful lants. In the Pahranagat Soil Conservation Disrict in Nevada, there is a ditch with the banks grown up so solidly to quailbush (*Atriplex lentiformis*) hat crop weed and willows alike are kept out. This happened naturally, but in the Ahtanum District in Washington, a farmer rid his land of a serious infestation of white top (perennial peppergrass) y seeding down his irrigation ditch banks to a mixure of orchard grass and Kentucky bluegrass. The rass is grazed lightly along with the aftermath in he field, and in that way provides a return as well as eeps out the weeds. Southernwood (*Artemesia brotanum*) shows great promise for weed control n the dryer banks of main irrigation canals in some parts of the country, and is being given careful trials vhere undesirable plants have become established.

Where good use can be found for its nutritious ubers and tops, Jerusalem artichoke can be used to eradicate quackgrass, according to USDA Technical Bulletin No. 33. This publication also gives simple directions for eradicating the Jerusalem artichoke, which quickly succumbs to clipping at just the right season of the year.

Two ways to control roadside weeds. Both are effective, but the burning (Lewis County, Idaho) is expensive, and must be repeated annually. From the other roadside (near Davenport, Wash.) the farmer has recently cut a good hay crop of smooth brome grass. The road district in the Latah-Rock Creek Soil Conservation District in eastern Washington has graded miles of roadside for farmers to raise hay, because the hay provides permanent control of weeds and erosion.

Whatever the local weed problem, soil conservation district farmers, assisted by Soil Conservation Service men working closely, in turn, with the Bureau of Plant Industry and other federal and state weed control authorities, are bringing good land use practices effectively to bear upon the situation and at the same time boosting war food production and farm income.

Soil conservation is not just an incidental bit of the mechanics of farming; it becomes an essential part of the whole business of making a living from the land, and is the only way by which we may have permanently productive land for a permanent agriculture for continuing support of the Nation.

WATER WILLOWS FOR SHORELINE EROSION CONTROL IN FARM PONDS

By HORACE J. HARPER

Water willow protecting shore line of dam on R. E. Hoy farm northwest of Covington, Okla., 1943. Bermuda grass safeguards upper part of dam.

Farm ponds are an important source of water for livestock in the southern part of the Great Plains region. Severe drouths in 1934 and 1936 convinced many farmers in this area that larger and deeper ponds are needed. During the past 4 years more than 23,000 farm ponds have been constructed in Oklahoma. Generally speaking, the larger the pond the greater the wave action on the shore. The character of the soil material and exposure to prevailing winds are important factors affecting the rate of bank erosion. Where rock can be readily obtained, a dam can be riprapped for a few feet below and above the spillway level to protect the structure from wave action, but the cost is high. In many areas, no stones are available and under such conditions bank erosion may be a serious problem.

One of the difficult problems of protecting a shoreline from wave action with vegetation is to obtain a plant which will grow in the water and also grow on the land. The rate of evaporation in the Great Plains area is very high during the summertime and runoff is frequently very low. It is not unusual for the water line to recede 50 to 200 feet horizontally with a lowering of 3 or 4 feet vertically. Few plants can live under such conditions. Many plants will grow in water but die as the water line recedes during periods of drouth. Other plants will grow along the water's edge but are killed if partially submerged. Vegetation such as cattail, rushes, smartweed and arrowhead require a fertile soil to produce a vigorous vegetative growth. These plants also prefer to grow in protected areas.

EDITOR'S NOTE.—The author is professor of soils, Oklahoma Agricultural Experiment Station, Stillwater, Okla.

The American lotus is objectionable because it wil grow in very deep water and completely cover th average pond in a few seasons. Primrose willov (Jussiaea diffusa) will grow in very poor soil an will live on an exposed shoreline but it is not effectiv in controlling strong wave action on exposed loca tions where there are high winds because it grow on the surface of the water and anchors its roots nea the shore.

A technical bulletin entitled "Larger Aquati Plants of Oklahoma With Special Reference to Thei Value as Fish Culture" by James deGruchy wa published by the Oklahoma Agricultural Experimen Station in 1938. In this publication the autho mentioned the drouth-resisting character of wate willow and its value in the clarification of mudd water. Several plants were transferred to one o the fish hatcheries near Lake Carl Blackwell, 6 mile west of Stillwater, Okla. This hatchery was draine in 1942 and 1943, but the water willow maintaine a dominant cover on the bank in competition wit annual weeds during this period. Since the wate willow will grow either in or out of the water, i has two requirements which are important in th control of shoreline erosion in farm ponds in thi region.

Water willows were planted in two ponds nea Covington, Okla., during the first week in July, 1941 At one of these ponds the dam had been severel impaired as a result of wave action. In the othe pond, not very much damage had occurred. Thes plants made a good growth during the summe and fall of 1941 and an excellent growth in 1942 In 1943 a dense growth of vegetation protected th

orelines along these dams from wave action where e water willow had been planted.

A picture showing the development of water willow along the shoreline of a dam 2.5 miles north and 5 mile west of Covington, Okla., is presented on age 212. Bermuda grass had developed a dense sod n the upper portion of the dam but it did not protect the shoreline from undercutting by wave action. small area of eroding shoreline which is not protected by the water willow will be observed in the ght side of the photograph.

The water willow reaches about 2 feet above the ater and has a small blue flower. It is an herbaceous erennial with willow-like leaves and a pithy stem. t grows in a wide range of soils, from moderately cid to basic; and makes a good growth on soils low n natural fertility. Since water willow does not row in water much deeper than two feet, it does not log the pond as do some other aquatic plants. Beause water willows occasionally become a problem n shallow water, they are often best used on steeply loping shores. Livestock grazes upon the water villow in the summer when the grass is no longer ucculent. This is not particularly objectionable alhough it may reduce the vigor of the plant. Fencing he pond prevents such damage, and is worthwhile or other reasons. According to deGruchy, more fish have been produced in Oklahoma hatcheries when water willows were planted in them than in hatchery ponds where other types of aquatic vegetation were growing. The production of large numbers of small ish is not desirable in farm ponds where fish are to e managed for food, and farm ponds having water willow will therefore be more difficult to handle for fish production. Waterfowl, on the other hand, make some use of the plant for food and shelter.

Individuals who are interested in securing water willow can obtain this plant at several different locations in eastern Oklahoma. Some of these locations are as follows:

Mohawk Park, Tulsa County
Mountain Fork River, McCurtain County
Reynolds Lake, Northern Atoka County
Dow Lake, Eastern Pittsburg County
North of Perry, Noble County
Fish Hatchery 6 mi. west of Stillwater, Payne County
2½ mi. N. and ½ mi. W. of Covington, Garfield County
Lost Lake and Medicine Creek, Comanche County

It is important to have vegetation not only along the dam, but also on all parts of a shoreline where soil or soil material is in contact with the water to control wave action. Muddy water occurs in many ponds which would be clear if wave action could be controlled. In other ponds the calcium content of the water is not high enough to coagulate the clay particles, consequently new ponds may not clear until the accumulation of organic matter along the shoreline will increase the calcium concentration in the water to a point where the clay particles will be aggregated and settle to the bottom. When a pond is newly constructed, frequently the fertility in the soil material along the shoreline is very low. It would be desirable, under such conditions, to fertilize the area in which vegetation will be planted to obtain a more rapid growth.

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unit. The individual unit width of these smaller machines is 4 feet, so that a machine of 2 units cuts a path 8 feet wide. On the larger pastures in Florida machines of 5 units are used, and in Texas, on the vast expanses of the King ranch, machines of 7 units, cutting weeds and sprouts in a path 28 feet wide, have put the mower to shame as a weed cutter.

Designed by a specialist in the grove and pasture problems of Florida, the cutter described has been adapted to many uses, ranging from the cutting of cover crops in orange groves to the cutting of impenitrable brush lands for the ever-expanding pasture improvement program.

Ten years of action for soil conservation—10 years of hard, unremitting work on the part of men and women imbued with an almost evangelical love for the land—have profoundly changed the situation from that which prevailed in 1928. Today farmers throughout the country do know about terracing, and also about the many other soil conservation measures and techniques which are protecting so much good land and bringing back into use so much of our damaged land.

SOIL CONSERVATION

CLAUDE R. WICKARD
SECRETARY OF AGRICULTURE

HUGH H. BENNETT
CHIEF, SOIL CONSERVATION SERVICE

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MUD BURIES THE PEARLS OF HAWAII

By E. H. BEACH

Of possible interest to the true conservationist is the story of what happened to the pearls of Pearl Harbor. As the Old Hawaiians had no written language, ascertaining the past history of the islands is a very difficult task. About the only records available are the logs of ships which passed through the "Sandwich Islands" in the old days, and the accounts of old residents who lived after the English language was introduced.

Several of these logs mentioned the fact that what was then called "Pearl River" received its name from the fact that it contained pearl oysters. One of these early voyagers was Lt. Hiram Paulding of the United States Navy, who visited the islands in 1826 on board the *Dolphin*.

By far the best account, however, was written by Sereno E. Bishop, who was born on the Island of Hawaii in 1827. He was noted as a scientist and a naturalist, and was the discoverer of "Bishop rings" around the earth after the eruption of Karakatoa in 1883. In his reminiscences, written in 1901, he gives the following account:

"The lochs or lagoons of Pearl River (Pearl Harbor) were not then (1830) as shoal as now. The subsequent occupation of the uplands by cattle denuded the country of herbage and caused vast quantities of earth to be washed down by storms into the lagoons, shoaling the water for a long distance seaward. No doubt the area of deep water and anchorage has been greatly diminished. In the thirties the small pearl oyster was quite abundant and common on our table. Small pearls were frequently found in them. No doubt the copious inflow of fresh water favored their presence. I think they have become almost entirely extinct, drowned by the mud. There was also at Pearl River a handsome speckled clam of delicate flavor, which contained milk white pearls of exquisite luster and perfectly spherical."

In the 42 years since Mr. Bishop wrote these words the picture has not improved any. Sugar and pineapple fields on steep lands bordering several large streams which drain into Pearl Harbor have deposited such vast quantities of mud that the Navy is obliged to do considerable dredging to remove it. Of course all sandy spots suitable for oysters or clams have long since disappeared.

EDITOR'S NOTE.—The author is an agricultural engineer with the Corps of Engineers, U. S. Army. He was formerly with the Soil Conservation Service.

Conservation measures on the land may someday be regarded as the most effective insurance yet devised by man against prolonged and damaging periods of scant rainfall.

Food for human consumption can be no healthier than the soil on which it grew.

Indeed, it has been stoutly contended that considerations of good human nutrition should begin with an examination of the soils on which our food is grown; that mineral-deficient soils ultimately produce mineral-deficient vegetables and milk; and that no amount of wisdom in the selection of a menu, or care in the preparation of food, can give nutritive qualities to food which was unable to find them in the first place in the soil.

To the extent that thorough going soil conservation work on the land is able to maintain and build healthy soil, so may it contribute to improved nutrition in far greater measure than we can now anticipate.

For REFERENCE

Compiled by ETTA G. ROGERS, Publications Unit

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SOIL CONSERVATION SERVICE

The Abolition of the Plow. Article by H. H. Bennett, Chief, Soil Conservation Service. (Reproduced from The New Republic, October 1943, by permission of the Editors.) mm.

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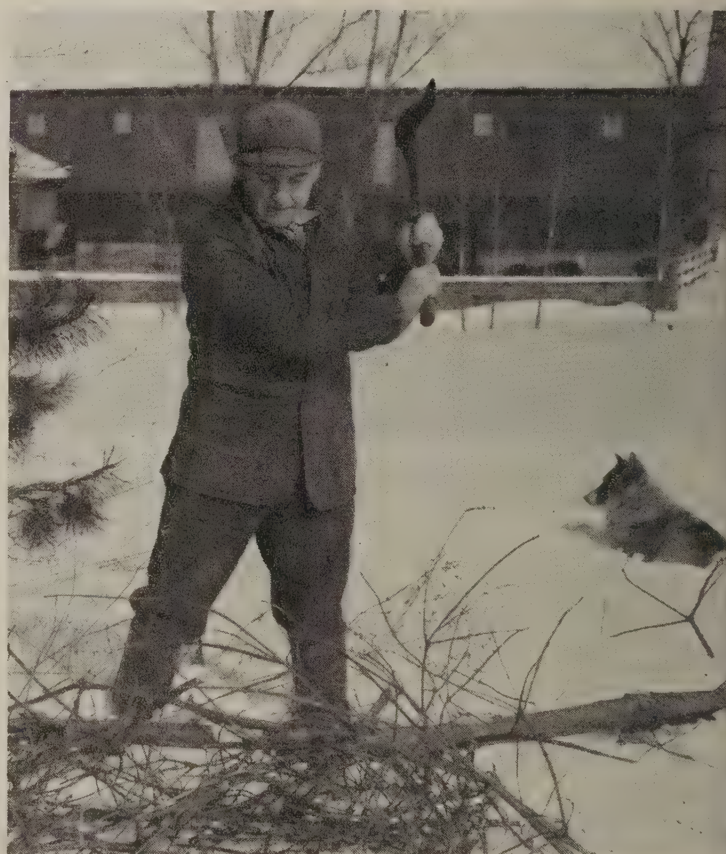
[1] From Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

"FOR YEARS TO COME"

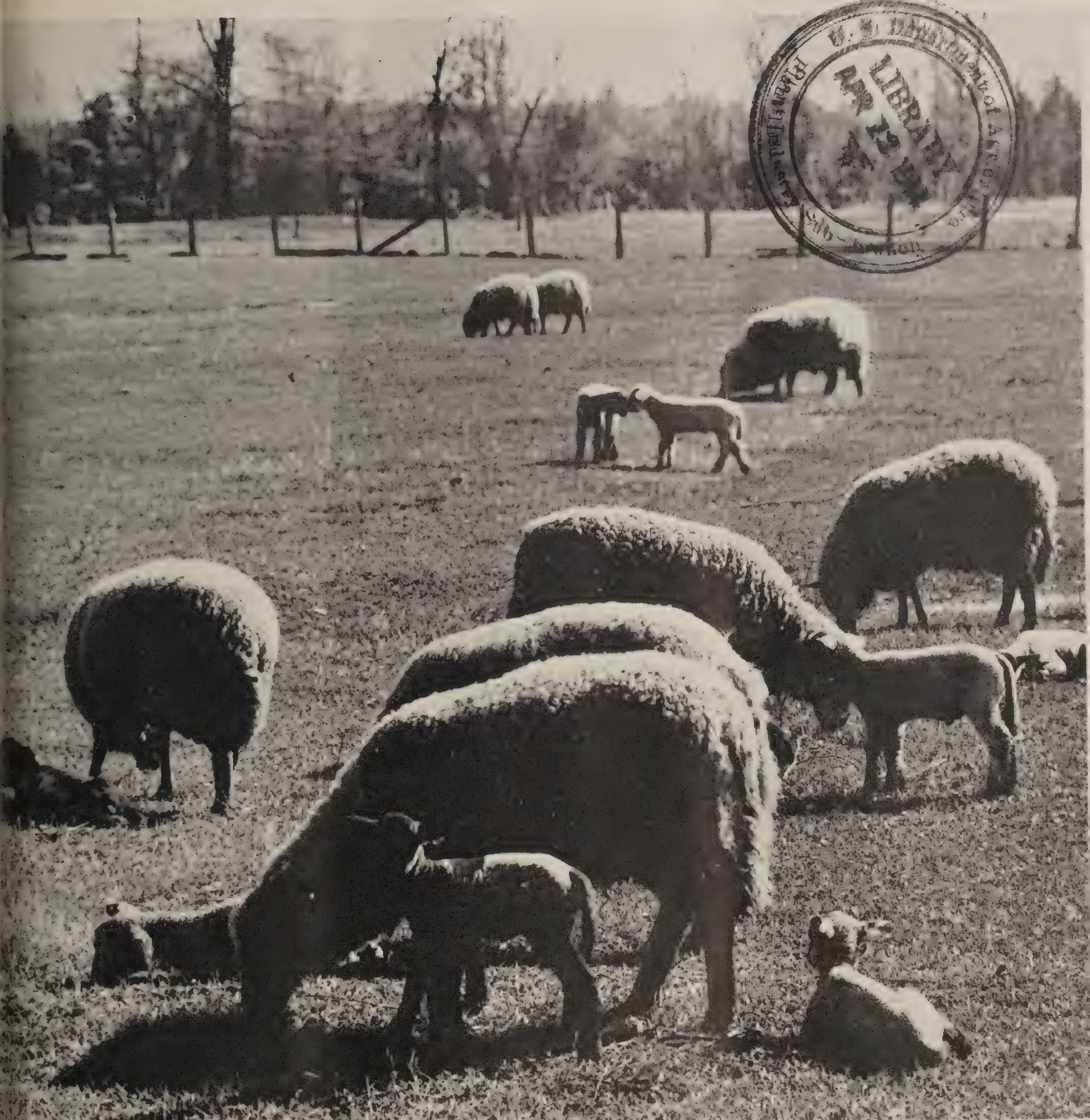


Last month a brief announcement was made in Soil Conservation concerning the new two-reel, color-sound film being readied for release by the Department of Agriculture, "For Years to Come." It was explained that the photographer, Rodney B. Radford, made numerous trips to the Pennsylvania farm of Christian B. Musser, for the purpose of recording the faithful round-the-calendar story of soil conservation progress. The various sequences in the picture depict the actual move from the standard methods of yesterday to the standard methods of today.

Here are two selections from the numerous "stills." They jump the months from late winter activity on a busy, conservation-minded farm to the bounteous rewards of a smiling harvest. They dramatize in miniature the brawny, brainy blows that American farmers are striking today for the freedom that is being implemented in large part by food. Soil conservation on the Musser farm, as on other farms from coast to coast, is vastly increasing production of war-needed crops while at the same time permanently safeguarding the productive lands for tomorrow's soldiers of peace.—The Editor.

Front cover photograph taken in the field by Richard W. Hufnagle, Soil Conservation Service, Nebraska.

U. S. GOVERNMENT PRINTING OFFICE: 1944



APRIL 1944

SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

...PARTMENT OF AGRICULTURE WASHINGTON, D. C.

Contents

Front Cover: Sheep on pasture of Leon Lewis, Barton County, Ga. Photographer unknown

WELLINGTON BRINK
EDITOR

SOIL CONSERVATION is issued monthly by SOIL CONSERVATION SERVICE of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. SOIL CONSERVATION seeks to supply to workers of the Department of Agriculture engaged in soil conservation activities, information of special help to them in the performance of their duties. Copies may also be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., 10 cents a copy, or by subscription at the rate of $1.00 per year, domestic; $1.50 per year, foreign. Postage stamps will not be accepted in payment.

Keeping tractors Fit to Fight

By L. E. LOVE

A disabled tank does not win battles, and a tractor laid up for repairs is not helping to produce food for victory. On the battlefield mechanics work feverishly night and day getting tanks and airplanes back into action. Certainly we on the home front should do our part by using every precaution to keep our equipment in excellent condition.

Although our equipment is old, the Service and the soil conservation districts have spent ample money for maintenance, and the machinery should be in good condition. The fact that a number of units are idle or in poor condition, however, seems to indicate that a part of this equipment has been abused or neglected. It also points to the need for reviewing the basic principles to be observed in caring for heavy machinery.

A new tractor, if properly operated, lubricated, and adjusted, will run from 4,000 to 5,000 hours before major repairs are needed, and after an overhaul will give 2,500 to 3,500 hours of efficient service before another major repair is required. The average tractor, properly maintained, should give at least 10,000 hours of service before it is traded or retired from use, and I know of a number of tractors that have operated from 25,000 to 50,000 hours and are still giving efficient and economical service.

If, however, the new tractor is not properly operated, lubricated, and adjusted, it will probably need an overhaul after 800 to 1,000 hours, possibly even sooner. It matters not whether the tractor was put in the repair shop through neglect, ignorance, or willful misuse—the effect is the same. It is a crippled machine hampering the war effort.

"Water and the Land" will be discussed in next month's issue of *Soil Conservation* by the Hon. Marvin Jones, War Food Administrator, who has kindly permitted the reprinting of the brilliant address he made on a national radio hook-up the night of March 10.

EDITOR'S NOTE.—The author is head of the construction section, regional engineering division, Soil Conservation Service, Albuquerque, N. Mex.

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I believe that the Service could get maximum use from its tractors and keep maintenance costs at a minimum by the application of four simple rules:

1. Clean and refill the oil bath air cleaner daily.
2. Keep tracks in proper adjustment—neither too tight nor too loose.
3. Use clean fuel.
4. Keep the machine properly lubricated (including oil changes).
5. Practice "preventive maintenance." Prevent costly repairs and prolonged shutdowns by proper care.

Everyone recognizes the necessity of washing the oil bath air cleaner and refilling it to the proper level with clean oil once each day, but this important operation nevertheless is sometimes neglected.

Tractors usually work in dust, an abrasive that will cause excessive wear in contact with wearing surfaces. In either gas or Diesel engines, air is drawn into the combustion chamber. If this air is not filtered or washed before it gets to the chamber, dust will reach the piston rings, cylinder and piston walls, valves, and valve stems. Naturally, there will be scoring of these parts and very soon compression and explosion will force some of the abrasive past the piston into the lower chamber, where it will be mixed with the oil. The oil pump forces the oil and the abrasives to every bearing, gear, and moving part of the motor. Before long, a complete overhaul and replacement of parts will be needed.

It takes only a few minutes each day to wash out and refill the air cleaner. If it took 45 minutes, it would still be economy. Taking proper care of the oil filter is just as much a part of the operator's duties as driving the tractor, and he should be removed from the job if he neglects this duty.

Next, let's see how the operator may take proper care of the tractor tracks. Track assemblies on crawler-type tractors take the hardest beating of any part of the machine. They are in dust, dirt, mud, gravel or water all the time. With the exception of sharp sand under water, these physical conditions can be successfully dealt with if we take intelligent care of the track assemblies.

We need to keep two things uppermost in our minds: lubrication and adjustment. Keeping mud and dirt cleaned off the track assembly will pay dividends too, but lubrication and adjustment are more important.

A track is properly adjusted on a 50- to 60-horsepower machine when you can lift the track 2 inches above the track carrier roller. A tighter adjustment causes the track to bind at its 35 pins and bushing. If this tension were maintained, it would wear out the pins and bushings, as well as the front idlers, drive sprockets, and bearings in a comparatively short time.

Land leveling near Las Animas, Colo.

The more common practice, however, is to run the tracks too loose. A loose track will not stay in alinement. It tends to ride the flanges on the idlers and track rollers, will crawl to the top of the teeth on the drive sprocket, and, when traveling at high speeds, will bounce and whip against the track rollers, often breaking roller flanges and track pin bushings. Eventually, the flanges will be in such bad shape that the tracks will run off the idlers when the tractor is making a turn.

Crawler-type tractors should be driven on a road or highway no more than is absolutely necessary and then only with the tracks properly adjusted. It costs $352 to buy two new track chains and, in addition, considerable labor is required to change the shoes from the old to the new chains or rails.

Besides keeping the air filter clean and the tracks properly adjusted, the operator should be careful to use clean fuel. Dirty fuel causes fouling, missing, uneven combustion, and loss of power. It will also cause excessive wear of fuel pump parts and plug the sprayer injection nozzles.

The commonest cause of dirty fuel is that the barrel in which the fuel is carried may have rust, sediment, scale, water, or other foreign matter in it. When a barrel of fuel is brought to the job in a pick-up or truck, the sediment is stirred up and suspended throughout the barrel. For that reason, the truck should be parked for at least 4 hours after reaching the job so that the foreign matter will settle. Then the pump or suction hose should be cleaned of any dust or dirt and inserted in the barrel so that the end is 2 inches from the bottom of the barrel. In this way, sediment will not be drawn into the tractor tank. All fuel filters, traps, and strainers must be cleaned and serviced regularly.

The easiest, cheapest, and most efficient way to keep tractors in good running order is to practice *preventive maintenance*. This means that the operator must have the training and willingness to treat machinery with respect.

When the well-trained operator comes to work n the morning, he opens the drain cock under the uel tank and drains off any sediment, water, or oreign matter that may have settled to the bottom f the tank during the night. Then he checks the adiator and crankcase, to see whether he needs to dd water or oil.

If the tractor has a Diesel engine, he starts the mall gasoline starting engine and lets it run at ormal speed. While this motor is running and varming up the Diesel engine, he takes his volume ompressor and grease gun and, starting at the front f the tractor, greases every point on one side of the nachine until he gets to the drawbar.

By this time, the Diesel motor should be warm. He throws the starting clutch in and starts the Diesel notor turning over. After it has turned 25 to 50 evolutions, he shifts the injection pump control lever rom the "stop" to the "run" position. The Diesel notor should then start, and the operator cuts off he starting engine and lets the Diesel engine idle vhile he lubricates the other half of his tractor. By he time he has finished, the Diesel engine will be varmed up, the oil circulating, the temperatures qualized in the various parts of the motor, and his ntire machine lubricated for the day's run. He puts his grease guns in a safe place where they will not be damaged or covered with dirt and starts his day's operations.

Terrace construction, Union County, N. Mex.

Scooping out a stock tank, Claunch-Pinto Soil Conservation District, N. Mex.

During the day's work, the operator stops and makes any necessary adjustments, such as the tightening of nuts and bolts. In other words, if he notices something working loose, he makes the adjustment at once. If he should wait until the noon hour or the end of the day, serious damage may be caused and replacement of the part may be necessary. It is a "must" that sufficient tools be with each piece of equipment at all times.

This type of operation is preventive maintenance. It's the old principle of an ounce of prevention being worth a pound of cure. We speak of tractor repairs and shut-downs as equipment problems. Usually, they are *human* problems. The life of a tractor or of any other piece of heavy equipment depends primarily on the way human beings operate and maintain that equipment.

I repeat that a broken-down tractor is a victory for the Axis. Let's handle our machinery with intelligence and care and thereby hasten the day when peace will come again.

DRAINAGE DOUBLES YIELDS ON MARYLAND'S EASTERN SHORE

By R. E. UHLAND

A survey of 67 farms on the Eastern Shore of Maryland shows that drainage work pays big dividends in increased food production. The average corn yield on 17 farms in Caroline County increased from 19.6 bushels per acre to 42.9 bushels after draining. On 23 farms in Queen Annes County the increase was from 11 bushels to 38.9 bushels, and on 24 farms in Somerset County the corn yield was raised from 30 bushels to 50.4 bushels.

Wheat, hay, fruit, and vegetable crops were similarly improved. The average wheat yield of all farms included in the survey more than doubled, being raised from 11.2 bushels per acre to 22.7 bushels per acre. The hay yield of 64 farms jumped 0.84 ton per acre to 2.25 tons after drainage. The yields on three additional farms in Kent County, where 315 acres needed drainage, were similarly improved. Corn increased from 24.3 bushels to 46.1 bushels,

Editor's Note.—The author is research-operations liaison officer, Soil Conservation Service, Washington, D. C. Good background reading for this article is provided by Ray W. Carpenter's "Districts Invoke Drainage to Increase Crop-Growing Area," which appeared in the June 1943 issue of this magazine.

Lack of drainage limits crop production on this type of land. Not more than one crop in 3 years can be counted on.

Draglines were used extensively for improving the drainage in eastern Maryland.

wheat from 14.3 to 24.9, and hay from 0.87 ton to 1.51 tons.

Plans for the survey were developed after a general field inspection of several drainage projects by representatives of the Soil Conservation Service and the Maryland Agricultural Experiment Station. They provided for personal interviews by field technicians in the course of their regular work.

The description of the land in these farms with respect to use and yields, before and after drainage, are shown in the accompanying table. There were 10,879 acres in the farms surveyed, of which 6,692 acres or 61.5 percent needed drainage. Much of this land had been drained earlier but many of the ditches, especially the major outlets, had become clogged. As a result 1,845 acres or 39.0 percent of the cultivated land failed to produce a crop almost every other year. The improved drainage consisted mainly of large community and tributary ditches. These open ditches were supplemented on eight farms by a few lines of tile.

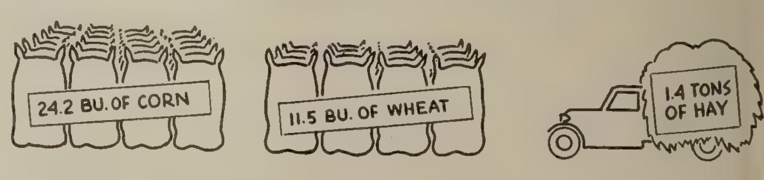
Douglas Rochester of Barclay, in Queen Annes County, had this to say concerning drainage: "Half of my tillable land was uncertain of crop production because of poor drainage. Only in fairly dry years did I realize anything from this land, but since the Oxdale ditch was dug by the CCC camp, I have not had a crop failure due to poor drainage and my yield per acre has increased. This ditch is a wonderful benefit to my farm."

Howard J. Stant, of Price, reported an average yield of 55 bushels of corn and 25 bushels of wheat per acre after the opening up of the Sugar Loaf tax ditch in 1936. Prior to this his acreage yields were 25 bushels of corn and 15 bushels of wheat. He declared that he could not adequately express what drainage has done for him. "When I bought this farm of 215 acres in 1932," he said, "it was grown up in briars and bushes. The first year I was on this farm I agreed that it was just about what the neighbors called it—"a frog pond." I thoroughly ditched the farm, but did not have sufficient outlet for the water until the CCC camp opened up the Sugar Loaf ditch in 1936 and the soil conservation district opened up the Kimbles branch in 1942. I now have a farm that will produce as well as any farm in this section."

This testimony is indicative of what farmers in eastern Maryland have experienced with drainage. They have found that it is much simpler and far more dependable to improve the drainage of their land than it is to depend solely on favorable seasons. With improved drainage supported by proper cropping and cultural procedures, these farmers have learned to expect a good crop every year instead of only about once in 3 years on much of their land.

The Agricultural Census shows that in 1939 there were 133,469 acres in drainage districts in Caroline, Queen Annes, and Somerset Counties. Surveys show that there is still a large acreage in these three counties that needs drainage. Part of this is inside and

What improved drainage added to the production of each drained acre cropped to corn, wheat, or hay.



part outside of the drainage districts. While it is recognized that not all of the land is in need of drainage to the same extent as the farms in this survey, the findings show that adequate drainage more than pays for itself through increased production.

Field technicians of the Soil Conservation Service work with the soil conservation districts in Maryland. They study the land in the districts in much detail. They determine, in cooperation with the farmers,

(Continued on page 231)

Effects of Improved Drainage on Crop Production [1]

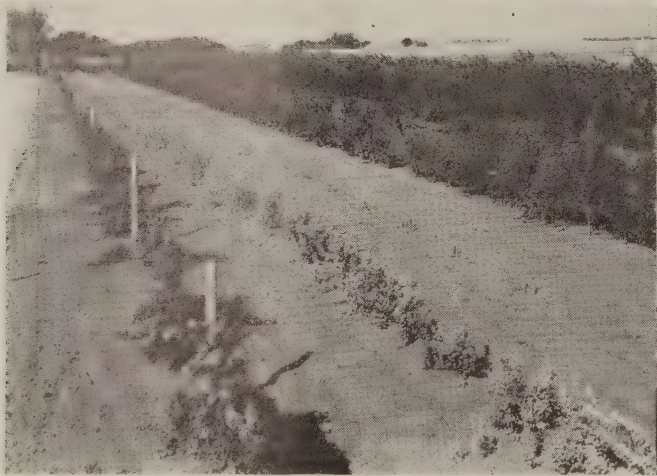
[Survey of 64 Farms on Eastern Shore of Maryland]

	Caroline Soil Conservation District	Queen Annes Soil Conservation District	Somerset County	Total for 3 counties
Number of farms included	17	23	24	64
Total acres in farms surveyed	2, 967	4, 660	3, 252	10, 879
Acreage affected by drainage	956	2, 681	3, 055	6, 692
TOTAL ACREAGE NEEDING DRAINAGE				
Cultivated land:				
Before drainage	801	2, 129	1, 738	4, 668
After drainage	143	35	223	401
Idle land:				
Before drainage	42	8	0	50
After drainage	0	0	0	0
Pasture and woodland:				
Before drainage	113	544	1, 317	1, 974
After drainage	0	30	303	333
TOTAL ACRES FAILING TO PRODUCE A CROP BECAUSE OF POOR DRAINAGE				
Before drainage	554	1, 002	389	1, 945
After drainage	42	25	13	80
ACRE YIELD OF CORN, WHEAT, AND HAY FOR ARTIFICIALLY DRAINED LAND				
Corn:	*Bushels*	*Bushels*	*Bushels*	*Bushels, average*
Before drainage	19. 6	11. 0	30. 0	19. 5
After drainage	42. 9	38. 9	50. 4	43. 7
Wheat:				
Before drainage	10. 9	8. 3	15. 0	11. 2
After drainage	23. 0	20. 8	25. 0	22. 7
Hay:	*Tons*	*Tons*	*Tons*	*Tons, average*
Before drainage	0. 54	0. 42	1. 5	0. 84
After drainage	1. 80	1. 56	3. 2	2. 20

[1] Data were secured by James R. Carroll and William J. Frere, Jr., for Queen Annes Soil Conservation District, O. E. Kelley for Caroline Soil Conservation District, Paul T. Ward for Somerset County and Ralph W. Ruble for Kent Soil Conservation District. All of these men are Soil Conservation Service field technicians who are working with the soil conservation districts.

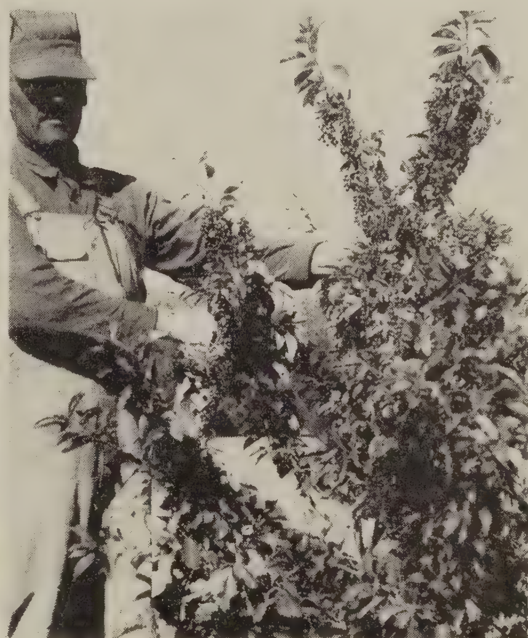
Drainage has made this field highly productive. Before drainage it could not be depended on to produce more than one crop in 3 or 4 years.

SAVE SOILS AND PASS THE JELLY



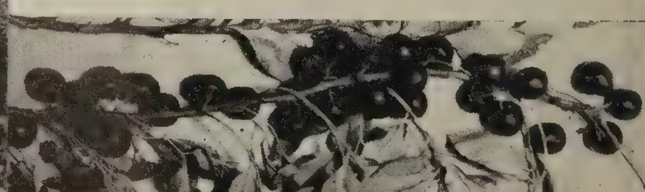
At left—above—is seen a field windbreak on Achille Lebbrecht's farm west of Fargo, N. Dak. At right we find Mr. Lebbrecht just 2 years later proudly displaying the fruit of his labor—wild grapes produced in the fence row. Other fruits to be found in this planting are chokecherry, plum, and sandcherry.

American plum (*Prunus americana*). The most widely distributed and used of all the wild fruiting shrubs native to the Northern Great Plains. It is about the most dependable fruit producer in the area and readily fits into almost every type of woody planting for soil and moisture conservation.



Western chokecherry (*Prunus melanocarpa*). Clarence Carrell displays chokecherry in 1940 produced from a planting made on his western Nebraska farm in 1937.

Golden currant (*Ribes odoratum*). The golden currant is particularly adapted to exposed and dry locations. Its range extends from the Rockies to beyond the eastern boundaries of the Plains. The fruit of the selected varieties, now in production at the Soil Conservation Nurseries, has excellent qualities for both jelly and preserves.



Western sandcherry (*Prunus besseyi*). The ability of the sandcherry to thrive on droughty sites and still produce fruit in relative abundance has added pies, preserves, and jelly to family diets in areas where otherwise fruit is scarce.

By M. S. McMURTREY and A. D. STOESZ

Fruit-producing shrubs planted in field borders, shelterbelts and farmstead windbreaks in the Northern Great Plains which long ago proved their worth in protecting fields and homes from winds, are now paying other and equally important dividends. An estimated half-million glasses of jelly, jam, and preserves go yearly into fruit cellars throughout the region.

This food resource is growing. The need for increased food production, and the scarcity and high cost of fruit on the market, have stimulated the growing of native fruits. And the possibilities for planting fruit-producing shrubs on small, odd, and irregular areas of farmland are being given greater consideration. Gullies, blow-outs, rocky knolls, rock outcrops, fence rows, field corners, irrigation canal banks and woodland borders—once commonly classed as areas of no agricultural value—are proving to be excellent for wildlife and for the establishment of fruit-producing plants.

Varieties native to the region hold first place. Shrubs in greatest demand by soil conservation districts in 1943—adding up to more than half of the 4¼ million woody plants consigned to districts—are American plum, chokecherry, western sandcherry, golden currant, and buffalo berry. Their popularity over other fruit-producing species lies in their hardiness. They thrive in a variety of sites and temperature ranges, and have the ability to do well in areas of low and erratic rainfall.

Although the Northern Great Plains is not usually considered a fruit-producing area, it is now evident that there is no reason why most of its families cannot have fruit for jellies and other table use by acting on the experience of other farmers and on the findings of experiment stations.

Western sandcherry is one of the good performers. A native of the Plains, its range extends from Kansas to Hudson Bay and westward to the foothills of the Rocky Mountains. Its preference is for sandy soils. It also does well under cultivation on the heavier soils, and has been established successfully on all sites in the Plains where trees and other shrubs thrive.

Early settlers picked western sandcherry in the wild and found it only slightly inferior to some fruits obtained from shrubs they brought overland. It was found to excell in winter hardiness, drought resistance, and tolerance of heat, but its fruit was relatively low in quality. State and Federal experiment station horticulturists recognized this as early as 1900 and since then have made selections for improved quality and larger-sized fruit.

In 1937, the Soil Conservation Service obtained enough plants of the thirteenth generation of improved strains to establish a seed production block. Thus, from a relatively small start, the quantity of planting stock of this species has been increased—70,000 in 1939, 195,000 in 1943. Indications are that demands for this and other hardy fruit-producing shrubs are still on the increase.

When a brown rot epidemic destroyed fruit on about 90 percent of the shrubs in the seed production plot, nursery technicians made cuttings from the 10 percent that escaped the disease. By selection and propagation the Service soon will have made still further improved planting stock available in the Plains region.

Nursery technicians are also giving attention to improving the quality of the fruit. The yellow and red fruit is less astringent than the more common purple-black. The goal is to produce a plant which is disease resistant and which yields fruit of high quality.

Farmers cooperating with soil conservation districts also give sandcherry a high rating. John Dillon, district conservationist in the Red River Valley in North Dakota, reports its popularity:

"Of the younger shrubs, sandcherries are the quickest producers of fruits for preserves, sauce, and syrup. The community of Pisek picked about 40 bushels of sandcherries at the Fred Seidl farm. These were planted in 1940. Many sandcherries also were picked on the Farrup ranch in the buffer strips in contoured fields. John Sven of Edinburg says the sandcherries from his 1941 planting made wonderful jams and jellies, also a syrup spread for hot cakes."

Out in Montana, Henry Hoye of Froid is another farmer who has had profitable experience with sandcherries.

Many families have traded plums and chokecherries to their local stores for groceries or have made outright sales this past year, thus adding to their cash income. Says Mrs. Elmer Staven, wife of a soil conservation district cooperator in North Dakota, "I sold several bushels of plums from our shelterbelt. Many of the younger boys and many farm owners in this community made good money from shrub fruits picked in shelterbelts."

Their dual value is what makes native fruit-producing shrubs so important to the Northern Great Plains. Plantings to conserve soil and moisture and bring waste areas into production are also being utilized as a means of supplying large quantities of high-vitamin fruits to farm families.

EDITOR'S NOTE.—The authors are chief, regional biology division, and chief, regional nursery division, respectively, Soil Conservation Service, Lincoln, Nebr.

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A FARMER TALKS ON PERMANENT COVER CROPS

L. W. Veerkamp is one of more than a score of farmers in the Central El Dorado Soil Conservation District who turn permanent cover crops in their orchards to double account by running sheep in them.

By ROY M. MARKS

I could talk at length about the beauty and value of our sheep, and about the virtues of the permanent cover crop in our 15-acre pear orchard that helps to feed our farm flock.

The sheep paid the irrigation bills during the tough years, and now in wartime are proving profitable producers of lambs and wool. The orchard cover and other soil-conserving grass crops enable us to deliver good stuff economically to the markets from our 178-acre place 3 miles southwest of Placerville, Calif. This place was an old, run-down ranch when we moved to it in 1924. Goats, too, played an important part in the ranch development. We used them to clear sheep pasture and to pay for the fencing. We are using them, also, on the approximately 50 acres of second-growth oak land yet to clear.

Editor's Note.—The author is president of the board of directors, Central El Dorado Soil Conservation District, Placerville, Calif.; also, member, El Dorado Irrigation District, chairman of the El Dorado County Farm Bureau, sheep department, and secretary of the Farm Bureau directors.

I was considered one of the laziest farmers in the country, because I insisted on using cover cropping and other practices so we would not have to plow in the orchard, for example, and so we could get more work done and produce more all over the ranch. When the Central El Dorado Soil Conservation District was organized by farmers in this area in 1940, though, I was mighty glad I had some experience to qualify me for the job they gave me on the board of directors.

In fact, I give these and our other time-savers, such as specially contrived stockpens and loading chutes, credit for giving me time to hold down this and other such jobs.

They ask me how I can serve so much time on boards. That is what makes it easier for me here at home—I generally learn something serving on those boards! Then, these things you see are all labor-saving. That is why we can run the ranch alone.

Cutting corners on labor is how Mrs. Marks and I were able to put 70 tons of hay through the chopper, except for $5 worth of labor, in 1942. It is how we managed to pick 4,268 boxes of pears by ourselves, saving $19.20 in hired labor. Our 14-year-old

on, Melvin, was then in the hospital with appendicitis and, of course, Irving is in the Navy. Mrs. Marks worked on the wagon hauling the hay, and I did the pitching.

Of all our "new wrinkles" in farming, as you might call them, grazing sheep on permanent orchard cover crops has attracted perhaps the widest attention. I guess I was one of the first to try that around here. More than a score of farmers in the Central El Dorado district alone now are using this practice. They include L. W. Veerkamp and George Volz of the soil conservation district directors. The other directors are Leo N. Ench and W. J. Clark.

I think cover crops are the main thing. A lot of these farms that I saw as a kid in this country were good farms. Then they went down until they weren't worth anything. There were hundreds of head of work horses. People raised too much grain for seed. Now, though, new fellows have taken over and are growing cover crops and building the ranches up into good places again. Through our district we've got a lot of fellows doing many things that they couldn't do by themselves before.

One such war feed and food production undertaking I have in mind is a full story within itself. That is the hammermill the district bought and rigged up to chop hay—urgently needed because our farmers are yearly increasing the numbers of livestock. District farmers jumped from 3,200 sheep in the local pool in 1941 to 7,000 in 1943.

We aim to keep around 100 ewes. With a 95 or 96 percent lamb crop in 1943, we had approximately

Roy Marks, writer of this article, admires three of his purebred Corriedale rams in a pasture near his ranch house, 3 miles southwest of Placerville, Calif. On the other side of the fence may be seen the edge of a small irrigation pond that abounds with edible bullfrogs.

230 head of sheep. I swear by these little farm flocks close to the house, where there is no reason why they cannot be given good care.

One of the main advantages of running sheep in the orchard is that they utilize a lot of feed that brings in a profit. My place is clean, along the fence lines, in the corners and around the buildings. My fire hazard is reduced to a minimum.

Our orchard cover consists of native grass, redtop clover seeded some years ago, and some Alsike. We like to plant a little Ladino, too. We turn in the sheep after the fruit has been picked, in September. They are left in usually not more than 2 or 3 hours in the evening, being taken out before they start wandering and attacking the trees. In the spring, the sheep are again pastured in the orchard until shearing time, because I like to have the ewes bed down with full stomachs every night. Always used dry feed to supplement the pasture feed.

We also believe it is important to have a number of fields and move the sheep around, to keep them from getting tired of one field and destroying feed, and to give the grass a chance to freshen up. We likewise try to have feed left over, instead of running short and having to buy.

We are especially proud of the "no plowing" technique made possible by the orchard cover crop and other grass-type crops. On the ranch I operated before taking over this one, we grew permanent cover for years, and never plowed.

We reason that not to plow cuts down the expense of operating—why plow it and wash all the good land down to the flats? Ditches had cut 2 feet deep, and you could hear the heads of water in them.

Ladino clover is a greate favorite. In summer, we keep the lambs on a 3-acre field irrigated by a sprinkler system installed under the water facilities programs. That Ladino piece has helped us to almost double our flock. We have worked out this conservation farming set-up under the same kind of a 5-year program we have used successfully for other parts of the ranch ever since we came here to live. This program provided for a considerable additional acreage of pasture for raising and grinding approximately 50 tons of oats and vetch hay each year, for terracing a 12-acre field which District Conservationist H. M. Lumsden tells me was the first job of its kind in the county, and for using yellow pine poles obtained in thinning from our good neighbor's woodland for barn rafters and studs and other farm building purposes.

We even have frog legs on the table when we want them, from the big croakers thriving in the

(Continued on page 231)

GOLDBERGIAN GADGET MAY BOOST VALLEY'S OUTPUT


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Editor's Note.—*Some months ago Writer Frank B. Harper of the Pacific Coast Region made it a point to journey south from Portland all the way down to El Centro in southeastern California. He wanted to look into what was being done to find the answers to drainage and allied problems affecting vital war food production in the Imperial Valley—the famed setting for "The Winning of Barbara Worth." Mr. Harper traveled among the Valley's fields of flax, alfalfa, winter vegetables, and rice stubble. He walked through grapefruit orchards and date palm groves. He skirted fine pastures where "Mexican" and Brahman cattle grazed, as well as cattle of the standard breeds.*

Mr. Harper took copious notes. He recorded the fact that there had been less than 1 inch of rainfall in the full year preceding with the annual average being around 3 inches. He noted that the highest annual precipitation ever reached was around 10 inches. The 30-mile-wide, fertile desert valley extends approximately 45 miles north from the Mexico border at Mexicali and Calexico to the Salton Sea. It depends upon 1,700 miles of irrigation canals to provide water, which is brought in from the Colorado River many miles away, and relies upon another 1,200 miles of drainage ditches to carry away the surplus.

Roughly, 475,000 acres of the Valley's lands are considered farmable. Approximately 412,000 acres are actually cultivated, the discrepancy between the two figures being largely because of poor drainage and resulting alkali conditions. Some of this land has been pickled since the days before the white man's advent. More important, drainage troubles are keeping many thousands of acres from producing at maximum capacity and must be solved before any major improvements may be expected.

Mr. Harper listened and scribbled literally for hours while District Conservationist William W. Fox and Assistants Vladimir Aronovici and William W. Donnan of the Division of Irrigation explained their techniques and apparatus, including the new and efficient truck-mounted soil-coring machine developed by Willis C. Barrett, now doing hydraulic engineering work in China on assignment to the State Department's Division of Cultural Relations.

At about this point, he met E. A. Fitzhugh, who is the editor of a leading California newspaper at El Centro. Editor Fitzhugh needed only a few of Photographer Robert Branstead's pictures, plus captions and some notes of his own, to scoop Writer Harper—much to the latter's delight. Following is Mr. Fitzhugh's intriguing account of how scientific research and ingenuity are rising to meet a practical need of the times.

By E. A. FITZHUGH

It looks like a Rube Goldberg arrangement of brass tubes, glass tubes, rubber hoses, tin cans and assorted gadgets, but if today's dream is the parent of tomorrow's reality, it may be the forerunner of the scientific age's greatest blessing for Imperial Valley farmers.

The Goldbergian gadget is the ambitiously named variable head multiple manometer discharging permeameter, but the chances are its future offspring—if those dreams are realized—will be called something simple, like drainage meter.

For at U. S. Soil Conservation Service quarters in El Centro, where Researcher V. Arnovici is the VHMMDP's guardian and Manager Bill Fox its awed sponsor, the machine is regarded as merely one step in a long series of investigations into the peculiarities of Imperial Valley soil when it comes into contact with water, or vice versa.

Even since it was set up, the VHMMDP has given birth to more widely roving offspring, for while the arrangement pictured with this article is a laboratory resident pure and simple, to which selected samples of earth are brought for testing, four smaller units have been constructed since its completion, and their function is to make the same tests under actual field conditions.

1. First step in search of solutions to Imperial Valley drainage problems is taking of soil cores with this new, truck-mounted apparatus developed by Willis C. Barrett. District Conservationist Fox and Engineer Donnan set up the A-frame preparatory to taking field samples.

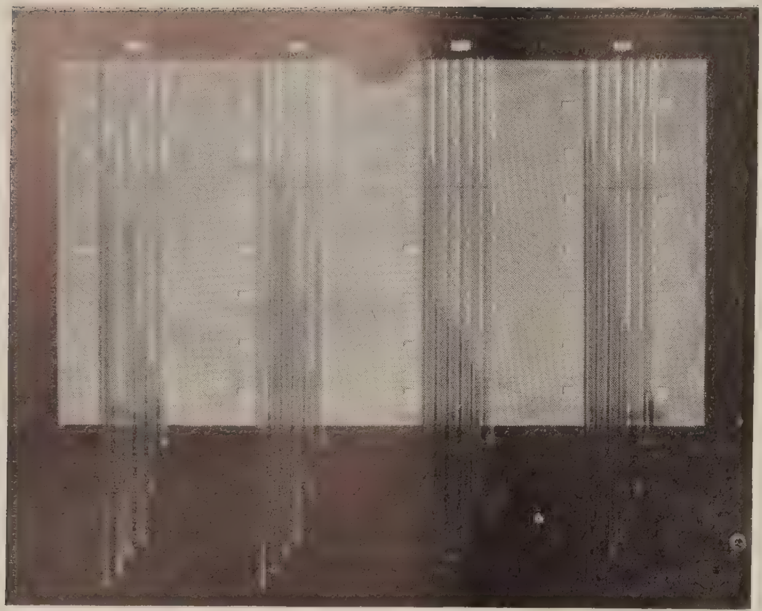
2. Donnan drives the soil tubes down with a jackhammer.

3. Fox signals that they are deep enough.

4. Donnan pulls up the tube with a Coffing hoist.

5. Fox removes the split inner-sleeve from the first 18-inch soil core increment on the corrugated-roofing logging-table marked in half-foot lengths, while Donnan cleans the coring cylinder.

6. Soil Technician Aronovici splits the samples with a knife to study their microstructure and the intricate stratification which have important bearing upon water behavior beneath the surface of the valley's croplands.



This manometer board measures the pressures at various points in samples of Imperial Valley soils. The samples are behind the board in the brass tubes described by the author of this article.

It is the hope of Fox, Aronovici, et al., at soil conservation offices, that some descendent of the VHMMDP, in the not too far distant future, may be capable of almost instantaneous operation. If that hope can be achieved—and the soil conservation workers stressed that it is nothing more than a hope now—the day may come when a farmer may come in with a core of soil from his farm, see it put into the machine, and within a few minutes be told what are the proper steps to take in providing drainage for the particular part of his farm from which the soil core came.

As nearly as a layman can understand the purposes of the present VHMMDP, it is to determine how fast water will run through a given bit of earth, and at what rate the seepage slows down during its progress. The knowledge has an extremely practical farming application, for it may mean the difference between successful and unsuccessful tile drainage, which in turn may mean the difference between extremely productive and entirely unproductive acres.

Facts Determined

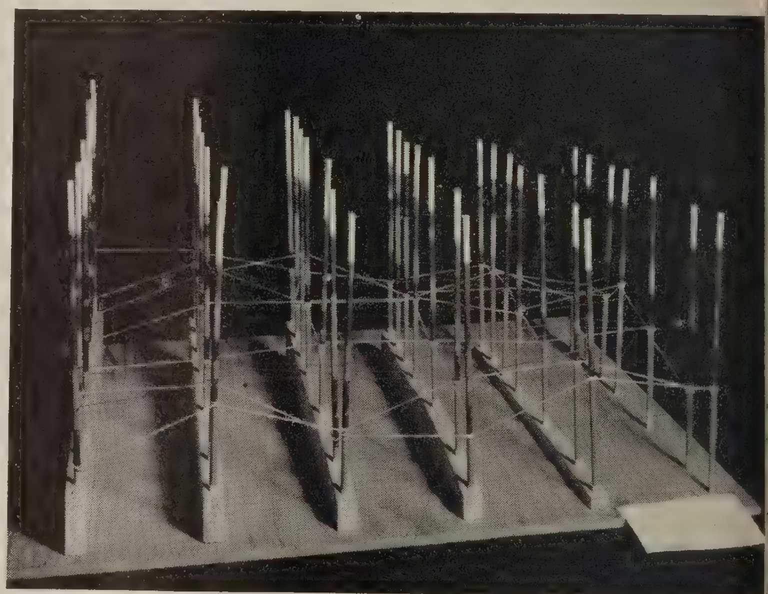
Through the laboratory's present machine, the soil Conservation Service has already determined a number of facts, including the one that minute stratification of mica flakes in some sandy valley soils causes water to flow faster horizontally than vertically through the soil.

Indicating the vast detail of work still to come if the valley is to be mapped according to drainage needs, Arnovici has discovered that in the more permeable of valley soils, the degree of permeability covers as wide a range as from 1,000 to 1, and a fa[r] wider range when the less open soils are included.

Simple Principle

The VHMMDP, sight of which is enough to con[-] fuse the uninitiated, operates upon a fairly simpl[e] principle. The skeleton idea of the machine migh[t] be likened to a water bucket with a pipe soldere[d] to the bottom, running downward and attached t[o] the bottom of an upright glass tube. If that wer[e] done, the water in the glass tube would rise to [a] height equal to that of the water in the bucket. If[,] however, the pipe were attached to the bottom o[f] a brass tube, the tube filled with earth, and glass tubes attached to the brass casing at intervals, th[e] water in each of the glass tubes would rise to [a] different level because of interference offered by the soil.

In other words, the permeability of the soil under different pressures would be measured. That is



This miniature forest of sticks represents underground conditions on a piece of land noted for its good drainage. Each small post stands for a soil core taken to 9-foot depth. The sticks are of different colors, each showing a distinctive type of soil. The strings tell the irregularities in the tops of the various soil strata. The white string nearest the 9-foot depth tops a layer of coarse soil material that makes this particular piece of land excellent for drainage—and war production—by permitting tile lines to work properly.

what VHMMDP does. But don't ask us how to read the results.

Ask Aronovici—or Fox.

After all, that's their job. It is a job they are doing for the Soil Conservation Service, in collaboration with the Imperial Irrigation District, the Farm Credit Administration and the University of California, all parties to the continuing drainage survey of Imperial Valley.

Tile drainage isn't the whole answer to Imperial alley's No. 1 agricultural problem.

If one thing has been demonstrated more conusively than another by the U. S. Soil Conservaon Laboratory in El Centro in the continuing ainage survey of Imperial Valley, it is that tile ainage is tops—but only when it is done right, nd only when the soil is right for tile.

Doing it right means mapping the underground, etermining the various types of soil material in ne piece of land to be drained, and laying the tile the right depth, in the right strata to give maxi-um results.

Kingpin in the business of delving into the earth's ecrets is the soil coring apparatus developed to probe a depth of from 9 to 16½ feet and bring up samples f the soil layers for examination by soil conservation gents employed in the continuing drainage survey.

Once the soil cores are examined and classified, is possible for the expert analysts to determine he underground make-up of the land, and even to map" it. One such map is that pictured here.

Coring, technical developments for examining the nake-up of various types of soil discovered at diferent levels, investigations to determine how readly water will seep through these types of soil—all hese are phases of the drainage investigation which is working toward eventual solution of the problem of waterlogged land and less productive acres.

Tile, the investigations have already disclosed, can lose a great deal of its efficiency if wrongly placed, and can gain greatly in efficiency if laid to take advantage of possible coarser, more permeable layers of soil found in some parcels of valley land.

The valley's soil peculiarities, however, present a constant problem to the investigators, for the make-up of soil may vary greatly from one farm to another, or even on the same farm. With this fact in mind, and realizing that every drainage project may present a new problem, the principal aim of the Soil Conservation Service workers at this time is to develop equipment which, someday, may make quick tests possible on individual parcels of land so that each farmer may know the character of his soil—and the best drainage method to be employed there.

Long strides have been made already in the development of such equipment. The soil coring apparatus, mounted on a truck for field work; the laboratory gadgets for finding out how fast water flows through various types of soil; the soil "maps" prepared and studied by the researchers; test wells and sumps established throughout the valley—these are steps completed or nearing completion since the laboratory was established.

Still greater steps are anticipated when the pressure of wartime is removed, and normal research conditions again prevail.

(Continued from page 223)

the best methods to effect better drainage on the flat lands and to control erosion on the sloping lands. They recommend land use practices which have been found effective in producing higher yields than under existing practices.

Research findings show that for best returns soil conservation farming must be initiated before erosion progresses too far. The production of sloping land is markedly lowered because of the loss of fertile topsoil. The deposition of eroded subsoil may also lower the potential production of the bottom lands.

It is obviously important that both sloping and flat lands be conserved. There are at present 15 soil conservation districts in operation in Maryland. Three of these are included in this study. These districts have as their major objective the practical conservation of their soils.

Experience has shown that an expenditure of from $10 to $30 per acre on drainage will raise the production of ordinary farm crops enough to pay the cost with but one or two crops. Drainage has also made possible the growing of fruit and truck crops on much of this land. These more intensive crops give much higher cash returns than do regular field crops.

In view of the urgent need for more food to help win the war and to assist in supplying devasted countries during the rehabilitation period, it is important that all possible means of obtaining more food from good land be used without delay. The data presented show that drainage offers an excellent means of accomplishing this end in eastern Maryland. They add substantiation to observations in other States, where better drainage has been an important factor in quickly augmenting the food supply.

(Cantinued from page 227)

little irrigation pond below the house. Two weighed a pound and a quarter dressed out, and I've counted as many as 68 of the big ones on the bank in one day.

From our start 6 years ago with 25 blackfaces, we have been able to improve the quality of the flock as well as the size. We now have all Corriedale and Romeldale sheep, including 4 purebred yearling Corriedale rams I bought in the spring of 1943; with their 4- to 5-inch fleece still on.

A NEW LEGUME-GRASS PARTNERSHIP

Pasturing second-year Canada wild-rye and sweetclover combination in late May on the Herbert Halverson farm in Monon[a] County, Iowa.

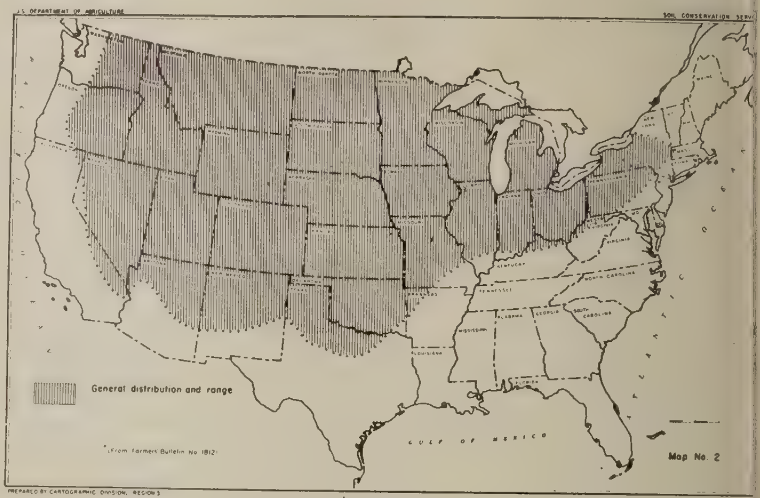
By MAURICE E. HEATH and MORTON C. JAMES

Canada wild-rye, which has only a fence-row background, appears to have a place in combination with sweetclover in short rotations on rolling land in western Iowa.

Preliminary on-the-farm results show that the sweetclover-Canada wild-rye combination forms a protective sod, practically eliminates bloat, and guards the land against soil washing between the time the sweetclover matures and the corn is planted the following spring.

Sweetclover, which grows very aggressively on the 6 million acres of Knox-Marshall soils in western Iowa, is used extensively for green manure, hay, and rotation pasture in short rotations. Its greatest weaknesses are its soil-loosening effect (on sloping land) and its bloat hazard when pastured. Prior to World War II, approximately half of the sweetclover in western Iowa was left over the second year and used as rotation pasture. It is with second-year sweetclover that Canada wild-rye can make its greatest contribution in the soil and moisture conservation program and as forage.

Twenty-nine field trials in western Iowa since 1939 have shown that Canada wild-rye, known botanically as *Elymus canadensis L.*, has consistently produced good stands in contrast with timothy and smooth bromegrass, which often failed. It is resistant to drought and heat, and grasshoppers, a perennial pest on western Iowa farms, like it less than smooth bromegrass. Canada wild-rye is large-seeded and easily established. In the trials it has been broadcast like



General distribution and range of Canada wild-rye in th[e] United States.

the cereal crops. Good stands have been obtaine[d] even under drouthy conditions. Both drills and end gate seeders were used to plant the seed, which weigh[s] approximately 26 pounds per bushel when processed. Satisfactory stands have been obtained with 2[0] pounds of Canada wild-rye per acre, the customary amount of sweetclover, and not more than 2 bushel[s] of oats. This rate of seeding has produced betwee[n] 5 and 9 Canada wild-rye plants per square foot in th[e] seedling year.

Observations have disclosed that when sweetclove[r] is in its second year, Canada wild-rye starts growing 2 to 3 weeks earlier in the spring, but both crop[s] mature early in August. Beef cattle have found that Canada wild-rye, when used in a mixture with sweetclover is palatable in its early leafy stages. Herbag[e] of the two species is grazed about equally when pastured.

At the soil conservation nursery at Ames, yields of processed Canada wild-rye seed under clean-cultivated conditions averaged 500 pounds per acre.

EDITOR'S NOTE.—The authors are associate agronomist, Division of Nurseries, Soil Conservation Service, cooperating with the agronomy section, Iowa Agricultural Experiment Station, Ames, Iowa, and assistant conservationist, Soldier-Maple Valley Soil Conservation District, Soldier, Iowa, respectively.

orkers found it somewhat difficult to use a comb e satisfactorily for harvesting field stands because t seeds are long-awned. Good results have been ained by cutting the crop with a binder, shocking, a l threshing with a stationary combine after the dles are thoroughly dry. The bundles are headed h a combine sickle, which greatly reduces the ount of straw running through the machine. Folving threshing operations with a combine, the seed run through a hammer mill at a reduced speed of) to 900. A $\frac{3}{16}$-inch screen is used for the reoval of the long awns. The seed is then fanned and ready for sowing.

Canada wild-rye is widely distributed in the upper ississippi Valley, and has been observed in fence ws in practically every county in Iowa. A large mber of individual plants was collected from field ands and planted in the nursery for comparative rposes. Strain variations in green-weight yields owed a range of from ½ to 4 pounds per plant and riation in height of 21 to 36 inches, while differences 24 days existed between the earliest and latest dates heading. Superior strains are being developed. ch qualities as disease resistance, quality of leaves d stems, forage yield, and lodging resistance are ven particular attention in the improvement work, cooperative project of the Soil Conservation Service and the Iowa Agricultural Experiment Station.


Canada wild-rye cut with binder and shocked to dry thoroughly prior to heading and threshing with stationary combine.

Among the cooperators with soil conservation districts in western Iowa who are field testing the sweetclover-Canada wild-rye combinations are Hervert Holverson, Soldier; A. S. Wendel, Bronson; Frank Head, Shenandoah; Ralph Liston, Glenwood; John Behrendt, Harlan; and V. Stuart Perry, Carroll.

Canada wild-rye stands a good chance of filling a definite gap in the vegetative program in the western two tiers of Iowa counties as well as in other parts of the Mississippi and Missouri Valleys.

GRASS SEED—FROM START TO FINISH

By M. M. HOOVER

Who among you, upon casual inspection of a sample of grass eed, observes not only the physical properties of the seed ut also sees the story of adventure, research, and labor that ecomes a part of that seed from its origin to the finished roduct? The story of grass seed, particularly in recent ears, is the story of conservation thinking and effort, of rogress and study, of trial and error, of the use of vegetation s a conservation tool. It is the story of plant improvement nd selection, of Bureau, State, and Service cooperation and, inally of success in bringing plants into new conservation se and into an integrated program harmonious to soil capailities and correct land use. We are fortunate during this ritical period in having a firm foundation of information and xperience on which to establish seed programs that will ffectively contribute to the national needs.

The story often packs drama. We may begin thousands of miles away with a single plant, the discovery of a plant explorer who must carefully husband his find until he returns to his homeland. Or, the rambling scientist may observe plants in agricultural use in other lands, already selected and improved by local plant breeders, that may be used advantageously in the United States.

The saga may begin with the choice of a native plant from among many thousands of similar plants—a plant of some superior characteristic which sets it slightly apart from its neighbors. Again, the chronicle may start in the laboratory of the plant breeder who applies his art of hybridization to the creation of a new progeny that combines in accurately predictable manner the desirable characteristics of chosen parents.

This progeny, as well as accessions from foreign lands or selections obtained from native stands, are assembled and subjected to a carefully organized series of observational tests to determine comparative values. Drama exists throughout each step of the evaluation process, for who will deny the plant breeder or the plant explorer the right to enjoy paternal interest in his contribution or discourage his sincere belief that in his particular selection or creation will be found all the virtues and few of the vices attributed to the plant kingdom? Is there not something of drama in each step of the domestication of a wild grass just as there is drama in the breaking of a wild horse? Interest in such domestication

EDITOR'S NOTE.—The author is assistant chief, Nursery Division, Soil Conservation Service, Washington, D. C.

is greatly intensified when the fact is appreciated that the native plant has survived and evolved in harmony with changes in environment since the beginning of time and now, under critical study and manipulation through a few short plant generations, submits to man's will and enters the fold in his service—as have so many economically valuable plants.

Nature has been generous in creating and maintaining infinite variations in plants and in adapting these ecotypes to widely differing environmental conditions. Man, in turn, has proved adept in recognizing these variable forms and appropriating them for his own use. The many species, varieties, and strains of plants now cultured by man are sufficient proof of this relationship.

Recent programs of soil and water conservation have introduced new and unusual uses for plant materials. Technicians engaged in conservation work are credited with recognizing vegetation as a conservation tool. Efforts have been made to maintain and increase plant density in pasture and range areas, to provide protection of arable acres by cover crops, temporary meadows, or strip crops, as well as increase in percentage the cultivated acres devoted to close-growing and sod crops. Nor have the undergrown portions of grass plants been overlooked, for plant roots serve to bind soil particles and thus protect against soil losses from wind and water erosion. Increased organic matter content and improved soil texture are closely associated with a cropping procedure in which grasses occur regularly in the rotations.

Conservation technicians are not content to make use of "just any" plant material. It is to their credit that efforts have been made to use the *best possible* plant materials for a given purpose. The technique required for the comparative study of a large number of plant accessions in terms of forage yield, palatability, conservation use, seeding habits, and other utility uses has given rise to the observational method of plant improvement now followed at 30 plant nursery centers maintained by the Soil Conservation Service. The major advantage of the method concerns the rapidity, economy, and thoroughness with which superior plants of a given species may be isolated from a large volume of plant material containing an infinite number of variable forms.

Initial observation, field trial, and seed increase represent the three major phases of this work. Accessions are grown in standard nursery rows where agronomic and utility notes may be recorded and compared readily. A selection is retained or discarded on the basis of its performance in comparison with other selections growing under similar conditions.

Field plantings located at chosen sites throughout the probable area of use and adaptation serve as crucial tests for those accessions that show promise in the initial nursery planting. These field plantings are usually one or more acres in size, and so designed that practical field equipment and field conditions will permit a careful comparative study. Practical evaluations of stand establishment, erosion control value, forage yield, palatability, plant association compatibility, and seed production are made of the selectio[n] being grown in the field trials; thus, the validity of bas[ic] information obtained in the initial comparative tests [is] expanded to practical analysis under field conditions.

Seed increase is the third and final phase of the observ[a]tional program, and wide distribution of seed will depe[nd] upon the adequacy of facilities provided for this activit[y]. The Soil Conservation Service, through use of producti[on] facilities at plant material centers, can produce sufficie[nt] seed for completion of adaptation studies, field tests, a[nd] such detailed research projects as the experiment station a[nd] cooperating research bureaus may wish to make. Howeve[r,] facilities at plant materials centers are not adequate to mai[n]tain a source of foundation stock, and also provide sufficie[nt] seed for general distribution and use.

Effective seed increase has been accomplished by tw[o] methods, (*a*) seed increase plots on farms of soil conserv[a]tion district cooperators and (*b*) seed increase by membe[rs] of state crop improvement associations.

In the former, the district supervisors are supplied wi[th] foundation seed of a new strain or variety which, in th[e] judgment of technicians representing the interested co[-] operating bureaus, has demonstrated its superior conserv[a]tion value throughout the observational program and shoul[d] be increased for general distribution. The district supe[r]visors assume responsibility for the seed and may use o[r] distribute it by either of two methods, as follows:

(*a*) Plant it on land which they, as supervisors, contr[ol] for the district, in which case the seed increase may b[e] distributed to district cooperators at cost of productio[n]. Since the district cooperators own the seed, they are pe[r]mitted to use further seed increase as they may wish.

(*b*) Allot the seed to district cooperator seed grower[s] for a share of the seed increased from the foundation see[d] lot for the productive life of the original planting, but i[n] no case more than 5 years. Under this arrangement th[e] district seed grower usually retains 20 percent of the see[d] produced annually for his own use and offers the remainin[g] seed to the district supervisors for purchase by other distric[t] cooperators at a price mutually agreeable to both see[d] producer and district supervisors.

Most states have seed certifying agencies that registe[r] and inspect the seed of a member-grower who conform[s] to specified standards and requirements. Through thi[s] procedure a seed purchaser is assured of obtaining a produc[t] of high grade and quality, as well as a guarantee of pedigree.

If soil conservation district seed growers follow the proce[-] dures and standards prescribed, they are eligible to becom[e] producers of certified seed. This is very desirable, since i[t] provides a means of rapidly increasing the seed of varieties and strains that have been recommended by the agencies working cooperatively in the program of grass improvement.

The State experiment station is responsible for recom[-] mending a given strain or variety of grass for use in the State; however, the research information on which this

commendation is based may be obtained through co-erative studies. During all phases of observation, field ts, and seed increase production, the new plant selections e under constant surveillance by trained technicians of e Soil Conservation Service, the State experiment stations, d other cooperating agencies interested in the improve-nt of plant materials. The evaluation of a given acces-on therefore represents the composite judgment of nu-erous technicians who pool their information and experi-ce to make a fair and impartial analysis of performance. ecommendations for certification by an experiment station e based on performances in cooperative studies.

Much can be said in favor of this pooling of judgment arrive at a critical appraisal. It not only reflects a ited opinion but also involves the dual or multiple use of ailable facilities of the cooperating agencies. For ex-nple, the assembling of plant accessions at nursery plant aterials centers for initial observation offers the plant eeder from the State experiment station or the Bureau Plant Industry plant materials which he could not as-mble and use effectively if the work of plant breeding ere undertaken as an independent bureau activity. Seed icrease and seed certification provide an opportunity for the ooperative approach to become far more effective than ould be possible if the work were not sponsored and ctively carried forward by all interested agencies.

In telling the story of seed improvement from start to nish, it seems we have fallen short of our objective to present rcefully the drama of accomplishment through cooperative pproach. There has been no time in our history of greater pportunity for teamwork, and the progress made in the nprovement and use of forage crops in our general agricul-ure during the past decade is evidence of what can be done y working together. Ten years ago one found relatively few ctive projects dealing with forage-crop improvement and orage-crop utilization on State and Federal research stations, hereas today projects of this type are receiving major ttention.

Although field programs looking toward greater use of orage species by action agencies of the Department of Agri-ulture have been beneficial in arousing interest in this work, y far the most important factor has been the incessant de-nand by individual farmers to make changes in their farm perations that will assure maximum safe and continuous roduction on each acre. The concept of land capability and orrect use of each acre demands the more general use of forage species and provides as well for the adoption of care-fully planned rotations. This concept, in turn, is contingent on cooperative effort of all the technical agencies concerned.

The general shortage of forage crop seeds is so critical in some areas as to threaten our entire production effort, and has led to the development of two programs to provide needed credit and stimulation.

The price-support program establishes a loan value to the seed grower by the Commodity Credit Corporation for forage crop seed meeting certain specifications as to purity and germination. This loan may become operative and is optional to the seed producer if the market value falls below a pre-determined level. The established loan value for seed that meets the required germination and purity standards thus serves as a guarantee to the producer. This program also provides a premium for seed of certified varieties and strains designated by State experiment stations that is grown in accordance with the standards of State seed-certifying agencies. The differential is sufficient to offset the additional cost of production to the grower.

A second program, also assisted by Commodity Credit Corporation funds, relates to the production of foundation seed of improved strains and varieties. Foundation seed is the direct result of hybridization and selection by plant breeders and experiment stations. Normally, the initial quantity of such seed is very limited, and facilities are not always available at experiment stations for safeguarding the genetic purity of foundation seed stocks until sufficient volume has been obtained to permit general distribution and use.

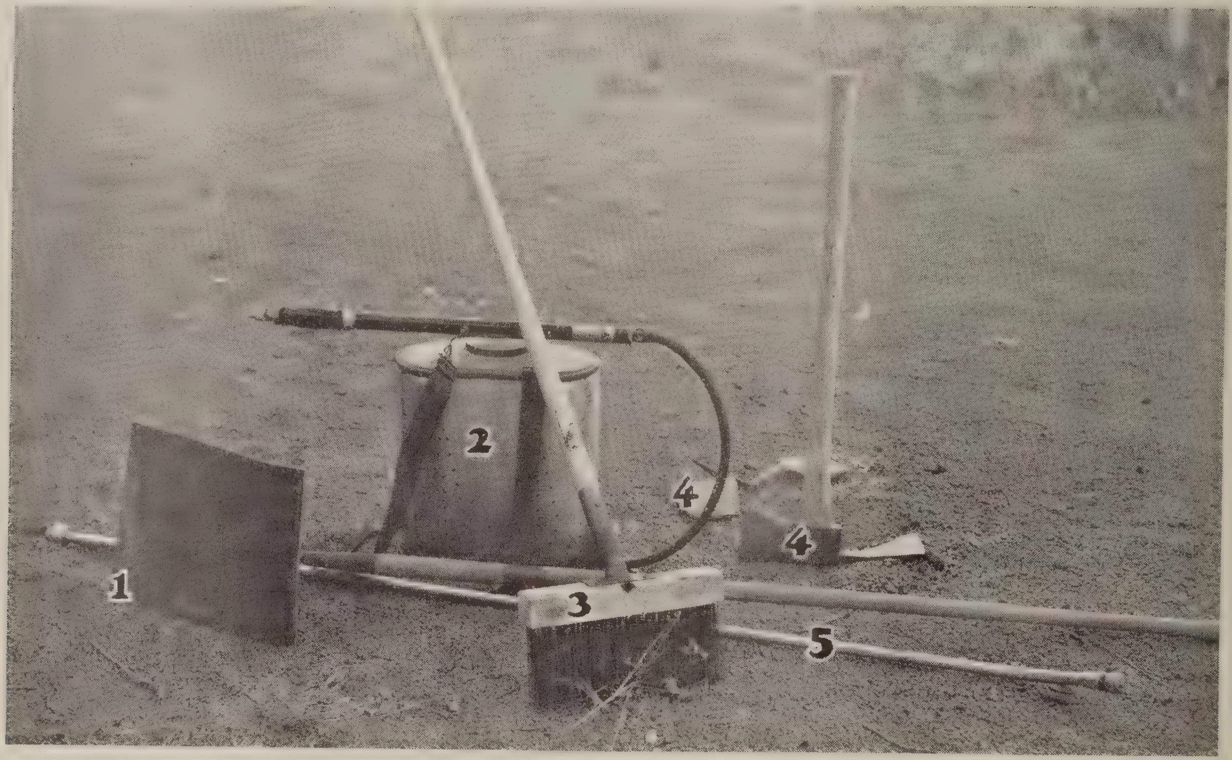
The proposed program for the increase of foundation seed stocks suggests the use of Commodity Credit Corporation funds for the purchase of available foundation seed stocks at a price designated by the experiment station or State seed certifying agency. This price is designed to cover the extra expense and care required in handling this special class of seed. The foundation seed obtained in this manner will be allocated to carefully selected seed growers chosen by the State experiment station, State seed certifying agency, and Commodity Credit Corporation representatives, the growers agreeing to follow the standards and regulations prescribed for the production of certified seed.

The State experiment station, State seed certifying agency, and Commodity Credit Corporation establish the price at which foundation seed is made available to the seed grower, as well as set a guaranteed price to the grower for all seed produced from the foundation seed stock that meets certifica-tion standards. The State experiment station or State seed certifying agency thus acts as agent for the Commodity Credit Corporation, and collaborates in establishing suitable prices for the different classes of certified seed as well as in the allocation of the seed to growers within their State.

This is the story of seed improvement from start to finish. It touches on the observational method of plant improvement, the advantages of cooperation among States, bureaus, and individual workers, the role of Soil Conserva-tion districts through their farmer cooperator seed growers as well as State certified seed growers. It indicates some of the new and special uses for grasses. It tells of depart-mental programs designed to stimulate and increase the production of imported varieties.

Thus, have I attempted to relate the headway being made with these important forage plants in the hope that still greater progress may be the reward in the future.

TRAINING PRAIRIE FIRE FIGHTERS IN NORTHEASTERN COLORADO



FIRE-FIGHTING EQUIPMENT

1. Swatter made from rubberized belting 12 by 18 inches, attached to handle. Specially adapted to short grass fires, it may also be used on tall grass fires but only to limited extent in brush.
2. Back-pack pump, capacity 5 gallons, secured by 2-inch strap harness. Water is forced either in single stream or spray.
3. Steel brush broom, handled like a push broom. Successful in controlling fires in short perennial grass. Not satisfactory in annual grasses, such as dry cheat grass.
4. Pulaski tool and guard, used to limited extent in construction of fire line through short grass on hard land. Loosens sod for removal by shovel.
5. Fog nozzle on power pump. Produces fine spray. Will extinguish short grass fire as fast as truck can conveniently move along fire line.

By F. R. STANSBURY and MORGAN L. MINKER

It was a fall day on the Earl Johnson ranch out in Weld County, Colo. Grass on the range swayed and rippled in a brisk breeze. Twenty-five ranchers and farmers, the county sheriff, several men of the Department of Agriculture, and a crew of civilian public-service assignees were gathered near the Johnson headquarters to take part in a prairie fire-control demonstration.

"I sure wouldn't want a grass fire to start on *my* place with the wind blowing like this," someone remarked. Another added, "If it got out of hand, it'd be just too bad."

Soon after this comment, a fire was set deliberately, and the hungry flames raced through the luxurious grass only to be checked within a designated area by experienced fire fighters. Despite the strong wind, a fire lane was burned around the Johnson headquarters.

The demonstration was a success, for it proved to the ranchers' satisfaction that grass fires can be controlled through organization of fire-fighting crews and the use of proper equipment. Since the demonstration came as the climax of a program of education in prairie fire fighting, it would be well to retrace the events that preceded it.

During the fall and winter of 1942–43, approximately 10,000 acres of native grasses were burned on the Northeastern Colorado Land Utilization and Conservation Project in Weld County. The flames ate up sufficient winter feed for 500 head of livestock and laid the ground bare to wind and water erosion.

The prairie fire was costly, but it did accomplish one thing: it awakened ranchers to the necessity of doing something to combat other fires that might sweep the prairies and destroy forage greatly needed for wartime livestock production.

The Pawnee Cooperative Grazing Association,

EDITOR'S NOTE.—The authors are, respectively, district conservationist, Fort Collins, Colo., and project manager, Weld County Land Utilization Project, Soil Conservation Service.

hich is cooperating with the Soil Conservation rvice in the use of range lands on Site II of the nd utilization project, took the lead. They came the Service with the request that a workable fire ntrol plan be developed.

This was a challenge readily accepted, and soon e Service technicians were conferring with Fort Service officials, the Colorado State Extension rester, the Fort Collins fire department, and local nchers. Naturally many and varied suggestions ere received. Out of them was developed a plan hich was submitted to the Pawnee Association for s approval.

The plan contemplated that the local people should e responsible for its execution. Basically, it resolved itself into two phases: first, proper organiation of available manpower; second, proper use of vailable equipment.

Since the land utilization project had already been ivided into definite blocks for administrative puroses, it was proposed that the Pawnee Association elect block wardens and assistant block wardens om members living within these geographical diisions. Next, a training course was outlined and re fighting equipment was listed for purchase or ssembly.

Then the educational program got under way. It as decided that the technique of fire fighting could est be taught through demonstration. The Service egan the training of conscientious objector assignees ocated at the Buckingham Side Camp in the project area. T. P. Treadwell, chief of the Fort Colins fire department, talked to the men on fire hazrds and ways of controlling fires. C. K. Collins, ssistant supervisor of the Roosevelt National Forst, assisted the Soil Conservation Service in teaching the technique of back-firing. After the assignee rew had received adequate training, arrangements vere made to hold a demonstration on the Earl Johnon ranch under actual field conditions.

The day of the demonstration—September 16—vas windy, and some of the ranchers feared the fire night get out of control. We knew, however, that ur fire fighters were well trained, and we decided to o ahead with the demonstration as scheduled.

First, the project manager called the group together at Mr. Johnson's barn, pointed out the blocks n a project map, and named the wardens and their ssistants in each block. Then he discussed the need for organization and cooperation in fire fighting, emphasizing the responsibilities of the block warden and the county sheriff in combatting fires that might start outside the project.

After all details of the fire control plan and methods of prairie fire fighting had been discussed, the group went to the field. The first part of the field demonstration was an explanation of names and uses of equipment, including back pack pumps, flappers, torches, shovels, pulaskies, brooms, and a 250-gallon tank equipped with a hand-operated threshing machine pump and a garden hose with nozzle.

Then came the real test—the test by fire. The grass was set ablaze and the project manager, acting as fire warden, gave orders to the crew of fire fighters. Working as a well-trained team, the crew kept the fire under perfect control at all times.

After this, other fire-fighting methods were demonstrated. These methods included (1) the construction of fire lines by lister and plows, using one and two furrows, (2) the use of a wet strip of grass to back-fire against when a mineral earth fire line is not feasible and natural barriers are not available, (3) the proper organization of a back-fire crew, (4) the burning of back-fires, and (5) methods of distributing men on a fire line.

After each demonstration, Mr. Johnson, the fire warden responsible for the block, was asked to take a group of farmers and ranchers through the same method to give them actual experience and confidence in methods of fire fighting. The men had watched each demonstration with such interest that they were able to apply their newly learned techniques quite successfully.

Within a short time, news of the demonstration had spread, and other farmers and ranchers urged us to give repeat performances. The second meeting, held for the Keota fire block, was attended by approximately 120 persons, including students from the Buckingham and Keota schools.

The county commissioners and the county extension agent have given valuable assistance in the fire control program. The commissioners have asked county road maintenance crews to bring a road maintainer and take part in the demonstrations, and the county agent has helped by telling farmers and ranchers living off the project when each meeting would be held.

In order to have sufficient fire fighting equipment on hand, members of the Pawnee Association have bought 25 back pack pumps, made flappers, and rigged up a water tank similar to the one we used in the demonstrations. Furthermore, members of the Association's fire control committee have made inspection trips to each rancher's headquarters to determine types of equipment available for fire fighting and to make suggestions for elimination of fire hazards.

The demonstrations will be continued until one has been held in each fire block.

SOIL CONSERVATION

CLAUDE R. WICKARD
SECRETARY OF AGRICULTURE

HUGH H. BENNETT
CHIEF, SOIL CONSERVATION SERVICE

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SHORT LOOK BEHIND—LONG LOOK AHEAD

Soil conservation is opening new frontiers, dramatic new rural opportunities. There is more than a hint, in the 1943 Annual Report of the Chief of the Soil Conservation Service, that much of the original, primeval America—the America of fertile soils, verdant hills and valleys, lush plains, and clear waters—can be brought all the way back; brought back, and included in the rich heritage of oncoming generations.

The intelligence and energy and imaginative genius of the New World agriculture are fighting today not merely for survival against dust bowl and flood but for wider and finer horizons. The partnership of the land and of the people is becoming vital and personal: they are merging their resources, pooling their powers. The same partnership which is performing astonishing feats in war is laying the basis for even mightier accomplishments in peace. It is preparing the way for a faithful and intelligent stewardship which will invoke on nearly every acre the best that can be drawn from science and experience and an awakened conscience.

Paragraphed here are a few pungent quotations from the latest summary of progress of the fast-maturing Soil Conservation Service. The summary is of added interest because it puts a period to the first eventful chapter of the book—marks the completion of the first 10 years of the formal soil conservation program—THE EDITOR.

The Nation's soil conservation program, born a decade ago and dedicated to the greater security and continued prosperity of man, is demonstrating its capacity for service in war time.

The methods of land use, soil protection, and water conservation, designed in time of peace to maintain and build the great resource of soil on which this Nation's agriculture is founded, have demonstrated a new and wider usefulness.

The year just past has marked the greatest forward strides in the history of soil conservation, not in spite of the war, but because the war demands the best from our agriculture, and soil-conservation farming is part and parcel of agriculture in this country at its best, today and tomorrow.

Intelligent, efficient use of land, rather than wanton exploitation, is the growing trend of the times.

No sacrifice is more pitiful and costly than needless sacrifice of productive land—man's most essential natural resource, along with water.

There is no other experience anywhere that is comparable to this continuing soil and water conservation movement, and the implications for its future are worthy of the most careful consideration.

Not more than 10 percent of the land in need of protection has been adequately treated to date. Ninety percent of the job is as yet undone.

The Service has cooperated with military establishments in various ways: In the acquisition of land; protection of military sites—more than 300 in all—against erosion, flooding, and poor drainage; in the production of maps for use in military operations; and in the development of camouflage techniques.

Currently, the Soil Conservation Service is devoting all its resources wholly to the furtherance of the Nation's war effort.

The war program of the Service accomplishes two things simultaneously: It makes its maximum contribution to wartime food production requirements and it paves the way to more rapid completion of the long-time soil conservation job of the Nation when the war is over. In short, the war program of the Service is geared to accomplish now those things which will at once contribute to the winning of the war and also serve the country's long-range objectives.

In soil and water conservation there is no substitute for knowledge and technical excellence.

The Soil Conservation Service is essentially a corps of trained, experienced land specialists organized to help—to serve—the farmer out on the ground, to provide security to the land and those who use the land, to build and sustain soil productivity, to strengthen the community and the Nation.

If there were some simple remedy for the ills of the land that could be applied indiscriminately, as a standardized treatment, the job of soil conservation would be relatively easy. But there is as much variety in erosion as in the landscape.

When it is applied to all cropland needing treatment, conservation may be expected to give us returns amounting to the production equivalent of a million new farms—and this without the addition of any more land.

Whereas much time during the last 10 years was necessarily devoted to research and development of the scientific techniques of conservation, it will be possible in the years ahead for personnel of the Soil Conservation Service to spend even more time on the necessary educational work and on the technical assistance which are requisites to application of conservation measures. We now know the fundamentals.

Soil conservation is the youngest of the agricultural sciences.

In the conduct of a Nation-wide program of soil and water conservation, depending for success wholly upon the full understanding and cooperation of the public, the Soil Conservation Service has recognized that continuing research work is essential to develop useful knowledge and continuing information work is essential to disseminate useful knowledge, before technical operations can be undertaken on the lands of private individuals with any assurance of success or permanence.

In a democracy, where no dictator can require conservation of soil and water, the effectiveness of a full, free flow of information in awakening public consciousness to a great national problem has been wholesome and convincing.

The principal gage of the efficacy of the training work lies in the fact that soil conservation has continued to make progress despite the war and reduced personnel.

For almost a year, the Service has been engaged in a survey and analysis of the soil and water conservation needs of the Nation. This undertaking, which is now nearing completion, will provide a factual, physical analysis of the land resources of the country, indicating what conservation measures need to be applied, and to what extent, if we are to achieve maximum efficiency and full productive use of our soil wealth.

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Compiled by ETTA G. ROGERS, Publications Unit

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MAY 1944

SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

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SOIL CONSERVATION

CLAUDE R. WICKARD · MARVIN JONES · HUGH H. BENNETT
SECRETARY OF AGRICULTURE · WAR FOOD ADMINISTRATOR · CHIEF, SOIL CONSERVATION SERVICE

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WELLINGTON BRINK EDITOR

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WATER and the LAND

By THE HONORABLE MARVIN JONES

War Food Administrator

One of the greatest contributions that this Nation has been able to make to our fighting Allies has been food. Without the food that we were able to furnish, gallant old England might not have survived during the dark days when she stood practically alone between civilization and organized destruction.

A short while ago a Russian general who fought in the Battle of Stalingrad told me that but for the food and supplies America made available for the heroic Red Army, the advance could not have been carried out as it was.

Without our rich soils that food could not have been produced.

The capital stock of a nation is its soil resource. No business can stand a continuing drain on its capital; likewise no nation can endure long excessive drains on its capital resources.

We were able to furnish this food because we had a vast, new country, rich in natural wealth.

What are soil resources? They are food and clothing locked up in nature's warehouse against the time when man, through his efforts, takes them out. Our great soil resources in this country have enabled us to develop a great race of people. History shows that the character and strength of a nation goes up and down with its soil.

In our fast development of this new country we have not always been careful in the preservation of our soil, and much of this valuable Godgiven birthright has been permitted to wash or blow away. We have cut down our timber on the watersheds and hillsides; and the rains have descended, and the floods have come and beat upon the soil, carrying it into the branches and streams and on to the sea where it is lost forever. There are only a few inches of top soil on which we must depend not only now but so long as we remain a nation. Man's destiny is linked to the soil. From it he came and to it he must return. From it he must draw his sustenance.

We stand aghast before the spectacle of destruction in so much of the war-weary world today—the devastated fields and gutted homes, the ruins of great cities now rubble and ashes and bones. But all this wreckage, even in the scorched earth areas, can be rebuilt with time and work. North Africa is already able to produce most of its food demands. Well directed efforts can restore production in the stricken areas. I do not minimize the destruction; but restoration can be rapid.

I am here concerned with an even greater destruction, of our own fields—not by the Nazi or the Jap, but a destruction of which we ourselves have been guilty, with our eyes open, our own hands stained with the dust and mud of our eroded soil.

According to H. H. Bennett, chief of the Soil Conservation Service, we have ruined more land in less time than any other nation in history.

More than 50 million acres of land in the United States, once cultivated, no longer produce crops. That is nearly as much as our entire wheat acreage last year. And the best topsoil has been washed away from an additional crop acreage twice as large as that. Fortunately, we are learning of this danger before it is too late.

Today our Mississippi Valley, and I mean by that the whole great area between the Alleghanies and the Rockies, is the greatest potential food producing area in the world.

Editor's Note.—The War Food Administrator made these remarks on a program of the National Broadcasting Company, March 10, 1944.

MARVIN JONES.
War Food Administrator.

Properly used and preserved it can, for centuries to come, not only supply abundance for our own people, but can help supply others with its products and bring back in trade additional goods for us to use and enjoy.

This great valley is full of abundance and plenty. We have the opportunity to use these resources fully and yet preserve them—or to use them fully and waste them. There is always a conservation use and wasteful use. In the past we have exploited our good earth with a prodigal disregard of its real value to our enduring life as a nation. We have sent the export crops down to the sea in ships and the soil down to the sea in mud. When the Mississippi overflowed at its mouth, we built levees. We tried to reverse nature, and when nature rebelled, as she always does, against such treatment, we built higher levees. We wasted both soil and water. Instead of using the water to our advantage, we tried to get it into the sea as fast as we could.

We have not learned that the wise way is to go back up where the water falls as rain and work with nature instead of against her; to utilize water at the source and thus treat it as a blessing instead of a curse. Whatever system will retain that water and soil is worth any national effort, however great. Out in the dry country not a gallon of water should be permitted to reach the sea. All should be used on the land. In other areas where it is abundant, it can be channeled and utilized for power, for additional wealth.

After the war our available manpower will eagerly turn from destruction in war to construction in peace; our engineering and technical genius and skills will turn from their prodigious feats throughout the jungles and deserts of the world in making war, to the constructive challenge that awaits them here.

It is not for me here to spell out the technical blueprint of how this may be done. We have, fortunately, in this country those who have proven in this war that they are able to carry out any task, however big the job may be. Once made aware of the challenge, the genius of America will meet it without any specific directions from me.

We now know better than any other people have ever known how to conserve our soil resources. Great progress has been made. The Congress, with far-sighted vision, has established a Soil Conservation Service and made provisions for carrying out an extended program of preserving our greatest natural source of wealth. Millions of acres have been scientifically protected and are now producing an average of 20 percent more than they did before.

But I am told that about 90 percent of the conservation job lies ahead.

Just what is there to be done? How many men and how many years will it take to do it? What will it cost? Fortunately these questions have been anticipated and studied by the Soil Conservation Service. A nation-wide survey has already been completed showing how much land needs treatment and where.

Here is some of the work that should be done. We need to build six million miles of terraces across sloping land on 95 million acres, to control water and protect the soil.

We need to drain about 30 million acres of some of our richest land, which is too wet for full production.

We need to build thousands of stock ponds for better livestock production, particularly in the West.

We need to improve our farm irrigation and water use on 12 million acres in our drier regions.

We need to plant soil-building and erosion resistant crops on thousands of mutilated fields.

There is other soil conservation work to be done by the farmers themselves and their neighbors. For example, 120 million acres of our farm land needs to be plowed on the contour. There is a need for strip cropping on 90 million acres and improvements of about 110 million acres of pasture. There are 40 million acres of unfavorable land now in cultivation that should be planted to grass, legumes, and trees as quickly as possible.

Fortunately farmers have become so conscious in recent years of the importance of soil conservation to their prosperity and security that they have already developed much of the machinery necessary to carry out this work. Seven years ago farmers organized their first soil conservation district. This enabled the farmers in that district to work together in a common effort to safeguard the land in that district. It worked so well that today there are nearly 1,000 of these soil conservation districts. These include about 2½ million farms and ranches that cover more than 500 million acres. In other words, the people themselves on the land are already actively on the job, so that what I have suggested is no new scheme.

Let us look forward confidently to our ultimate success in our efforts to prevent the loss of our natural resources. What will that success bring?

Let us use our great Mississippi Valley as an example of what we might expect in our other great watersheds on both coasts. I believe it is not too much to visualize a system of effective control over our soil and water resources.

This would include using the rainfall on the plains and hillsides where it falls, instead of letting it run off in waste.

It would include the many additional soil conservation districts that will then be joined in this common effort.

It would include an automatic form of natural crop insurance against drought; water stored in the soil during wet seasons would be available for crops in dry seasons.

It would include large dams on the rivers and thousands of small dams on tributary streams and in pastures and fields to give us flood control.

It would include electric power generated at the dams and flowing out over the productive countryside to the millions of farm homes that need it.

It would include protecting these dams against destructive silt, to insure our hydro-electric power—increasingly important in the years ahead as we view our diminishing supplies of coal and oil reserves.

It would also include a decentralized industrial development so that the raw materials would be close to the heart of the business community.

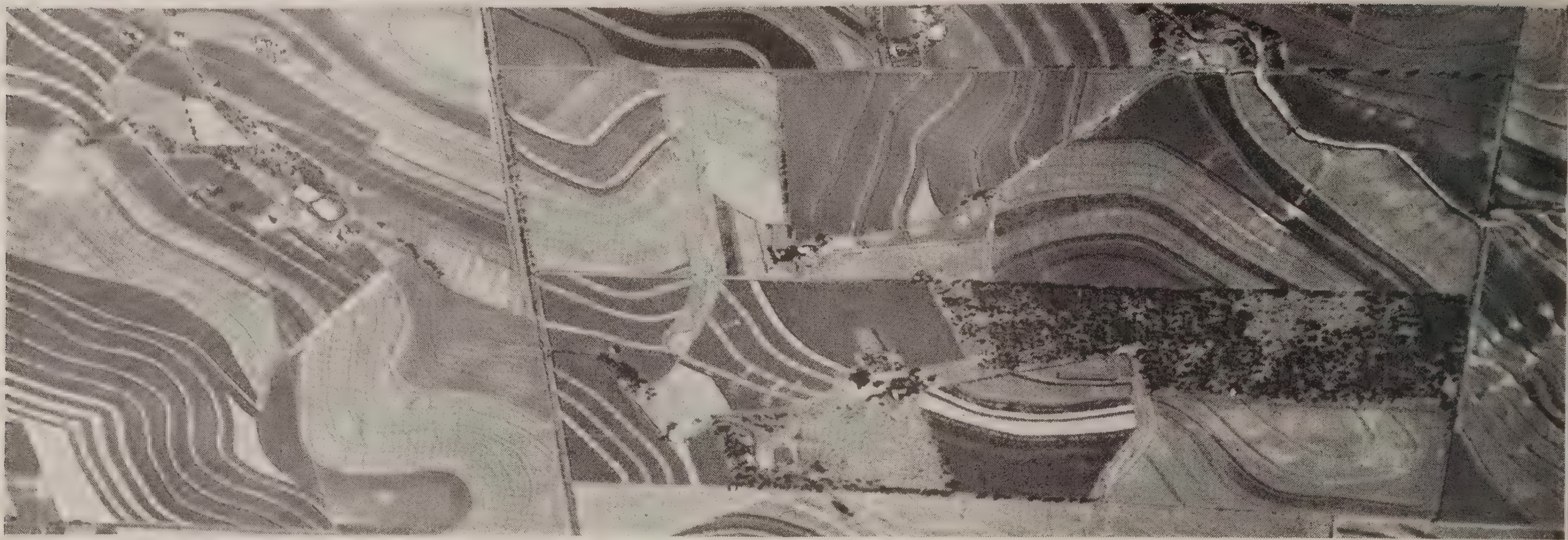
It would include a suitable network of highways and railroads and airlines as a natural part in this development.

It would include millions of farm homes made more secure against the future.

It would mean our ability to survive, for regardless of what we do, what plans we make, or what genius we may possess, our Nation must perish unless we take care of the soil.

The soil of our country is our heritage. If wisely used, its value, its strength, and its productivity are ageless. In peace or in war no nation can afford to waste its substance. The children of the future have a stake in this—our greatest source of national security.

Soil Conservation spreads



Across the Land

By R. W. ROGERS

The term "conservation" has been in use for many generations, but never in the history of man has conservation of natural resources, particularly that of productive soil, had a fuller or more important meaning than today. Consider the enormous drain on our national resources brought about by this present world conflict. Our supplies of vital materials such as oil, gasoline, iron, coal, timber and agricultural products—the most important of which is food—are being used in ever-increasing quantities. In times of war, as well as of peace, the first consideration of people the world over is food.

We as a nation can remain strong and progressive just so long as we can maintain or increase the productive capacity of our land, which is directly dependent on soil conservation and sound land use. Our production of food and various raw materials may have to be increased even further during the continuation of the war and for years following the war. The way to prepare our physical production plant—our productive land—for meeting the demand without serious damage to the land is through the spread of soil conservation practices.

Soil conservation practices are spreading throughout the United States. Farmers, and city people, too, are becoming increasingly interested in soil conservation because they are beginning to understand the significance of the fact that food, fiber, and timber all come from the soil. Only through conservation can our soil be safe-guarded and maintained for continued use. Most conservation practices are relatively simple—contour farming, crop rotation, controlled grazing, protected woodlands and so on. Others are a little more complex and difficult of application, such as terracing, drainage, and irrigation. But all have a place in our national conservation program, certain particular practices being primarily applicable to the various types of land use—cropland, meadow, orchard and vineyard, pasture, range, woodland, wildlife, garden, for example. The use of soil and water saving practices singly, and in combinations, according to land capability, is called conservation farming.

In the early days of American agriculture, settlers found plenty of good land available at little cost, and acquired the habit of looking upon land as limitless and inexhaustible. The custom was to clear a plot, use it for a few years, until the top soil was washed away, and then clear another field or move to another tract. This destructive and wasteful tendency continued until only a few years ago, when fresh land suitable for clearing began to get scarce. In the processes of exploitation, and migration from the worn out land to better land, there were left behind abandoned sites and millions of gullies. In the absence of soil conservation, the bare soil was exposed to the devastating effects of erosion. More than 50 million acres of cropland have been ruined for further practical cultivation; another 50 mil-

Editor's Note.—The author is chief, record and reports division, Soil Conservation Service, Washington, D. C.

FRONT COVER.

Texas quarter horses and colts grazing in a white clover, irrigated pasture, Santa Barbara County, Calif. Carrying capacity of pasture, 3 acres per animal unit. This picture, taken by R. B. Branstead, was among the illustrations which accompanied Mr. Rogers' manuscript.

VEGETATIVE AND MECHANICAL PRACTICES POPULAR—AND SUCCESSFUL—IN CHECKING EROSION.

Strip cropping.

Contour planting.

Terracing.

Pond construction.

Farm drainage.

Irrigation.

lion acres have been nearly as badly damaged and 100 million acres more have lost fully half of the topsoil. Of the 1,060,852,000 acres comprised in 6,096,800 farms and ranches of the United States, according to the 1940 Census, about 398 million acres are in cultivation. If developed and improved with soil conservation practices, the total potential possibilities for crop production are 400 million acres. The topsoil remaining is now on the average, less than seven inches deep.

Crop yields and production vary directly with the depth texture and structure of topsoil and with the amount of plant foods contained in it. Costs of production are higher and net farm income is much less

Wealth washed away: Result of uncontrolled soil erosion.

when the top soil is removed. Based on experimental evidence, it is estimated that the soil losses in the United States are now approximately 5,400,000,000 tons annually. With the weight of 7 inches of topsoil approximately 1,000 tons per acre, this soil movement represents the yearly loss of topsoil from 5,400,000 acres of fields and pastures. That this soil is on its way downstream is obvious to everyone during flood stages. It moves with every rain, and it moves as the wind passes across unprotected plains or other exposed dry sandy land. Topsoil is not replaceable, and subsoil can be made productive only after laborious processes and a long period of time.

As you pass by highway, railroad, or air, casual observation shows many places from which the topsoil is gone. Look in the lowlands, along fishing streams and navigable rivers, which once ran clear, and you will see debris and rubbish left by receding waters. Go down along the lower Mississippi River, or other rivers and streams, and see where some of the sand muck, and silt have stopped, to be pumped dredged and hauled, at great expense, to the levees harnessing the channels. You will also find streams that have filled, and drainage that is inadequate, and other areas that are covered by swamps or are too wet for agricultural use. Where rainfall is insufficient, many areas are too dry for crop production and water must be applied by irrigation methods. They are not pleasing sights. The human elements and the physical factors of soil and water losses must continue to be analyzed, treatment recommended, and vigorous action taken to insure the continued growth, prosperity and beauty of our country.

The application of soil conservation practices on the land increases yields on an average of at least 20 percent for the United States as a whole. After treatment, 100 farms will produce as much as 120 farms without treatment. A report by 9,244 farmers in 47 states shows that on their 3,900,000 acres the annual average per acre production of major crops has increased 33.5 percent as the result of soil conservation. Regional variations in percentage increase were as follows: Northeast, 33.0; Southeast, 40.4; Upper Mississippi, 25.6; Western Gulf, 35.0; Northern Great Plains, 35.1; Southwestern, 27.7; and the Pacific Coast, 21.3.

On these farms it was found that 1,380,000 more bushels of corn were grown on 32,000 fewer acres; 14,705 more bales of cotton on 2,892 less acres; 778,882 more bushels of wheat on 25,303 less acres of land. Increases in other crops and farm products, as a result of conservation farming, were equally as high. Livestock, numbers showed substantial increases, dairy cows 27 percent, beef cattle 22 percent and hogs 53 percent.

These results explain why farmers in many areas are requesting the Soil Conservation Service for more assistance than is available for the selection of land uses and establishment of practices.

In all programs dealing with soil and water conservation for which the Soil Conservation Service has been responsible, 309,746 complete conservation plans covering 99,164,540 acres have been prepared. Approximately 66 million acres had been completely

Tree planting.

Border strip.

Improvement cuttings.

treated with soil conserving practices on January 1, 1944. Approximately 17,889,000 acres planned and 7,385,000 acres treated were on public lands, and the remainder on private farms and ranches.

The State legislatures of 45 states have authorized farmers and ranchers to organize and operate soil conservation districts. Land owners are selected by the local people to administer the affairs of each district. These men comprise the governing body, and their job is to develop locally adaptable soil and water conservation programs, solicit all available cooperation and assistance, and effectuate plans for establishing soil conservation practices on farms and ranches.

The first district was organized in North Carolina, August 1937. Since that time this democratic procedure for cooperative action in soil and water conservation work has spread to all states in the

Union except three. As of January 1, 1944, 985 districts, containing approximately 559,282,000 acres had been organized. District supervisors are taking advantage of many kinds of cooperation and assistance from local civic and agricultural groups, colleges, county, State, and Federal agencies. The Soil Conservation Service is cooperating with districts by furnishing soil conservationists who have been technically trained in farm management, soils, engineering, forestry, agronomy, range management, and assists in the selection of proper land uses and the establishment of appropriate soil conservation practices. Limited quantities of machinery, equipment, materials and supplies have been furnished.

Farmers and ranchers are requesting assistance from districts in ever-increasing numbers. As of January 1, 1944, there were on file 327,301 requests. Farm conservation plans had been prepared on 201,111 farms and ranches containing 54,251,763 acres, and there were 25,204,205 acres within districts on which soil and water conservation practices had been applied. These plans represent a mutual cooperative agreement between the farm owner or operator and the district, in which it is agreed that each field will be used according to its capabilities in consideration of the farm needs, and that soil and water conservation practices necessary to control erosion and maintain or increase the productivity of the land will be established each year. In some areas farmers have organized into community or neighborhood groups, so that their combined efforts, thinking and improved techniques can be applied to conservation problems. During the calendar year 1943, requests to districts from farmers and ranchers showed a decided increase over previous years; 81,423 applications for assistance were received; 54,174 farm conservation plans, containing 17,629,318 acres, were prepared, and 9,865,697 acres were treated.

In an effort to speed the spread of soil conservation practices for immediate increased agricultural production, the Soil Conservation Service, in cooperation with soil conservation districts, State agencies, and other Federal agencies, has participated in a program known as the "widespread application of conservation practices." As a result of this program, one or more various soil conservation practices were applied on approximately 407,000 farms during 1943. At least 7,275,000 acres on these farms, 10 percent of the acreage, or an average of 18 acres per farm, were treated. Soil Conservation Service technicians participated in approximately 10,000 training meetings with district supervisors, farm and ranch operators and local agricultural leaders, at which over 200,000 leaders received instructions in the selection of land for specific crops and in the selection and methods of application of conservation practices on the land—practices which could be carried out with a minimum of available farm labor, equipment and other production supplies.

The local leaders who received this training held 16,924 meetings in farm communities, which were attended by 349,295 farmers and others interested in conservation. At each of these meetings and through individual farm contracts, instructions were given as to the benefits and methods of application of soil conservation practices in each community. Approximately 18,600 demonstrations were held on farms by technicians and locally trained leaders with groups of farmers actually demonstrating the establishment of practices. Over 70,000 farmers participated in or received definite on-the-job instructions at these demonstrations. A large majority of the widespread application work was carried out on farms which did not have farm conservation plans. Essential war crops were given major emphasis and practices which the farmers could establish with a minimum of effort were stressed. After seeing the practices established on their own farms with resulting increases in yields and production many of these farmers and operators have applied to district supervisors for farm conservation plans and additional technical assistance looking toward the establishment of the more complex practices.

Soil conservation practices are spreading into farm woodlands. Since May 1937, 46 farm forestry projects containing 30,744,734 acres in 34 states have been established. As timber supplies and woodland products, so vital to our war effort and civilian requirements, dwindle, each tree on American farms has more significance. These trees, comprising a forest of about 137,000,000 acres should be protected by soil conversing practices from malicious burning, overgrazing, and improper cutting. Farmers are beginning to appreciate the benefits of good woodland management. They are building fences to protect the woods from livestock; making selective cuttings of mature trees for the construction and maintenance of farm buildings and for sale; removing dead and diseased trees from growing stands, for fuel, pulp, and chemicals. Community organizations are being formed for the control and suppression of fires. Woodland improvement and soil conserving practices have been applied on many other wooded areas not having detailed woodland plans, as a part of the farm conservation plans.

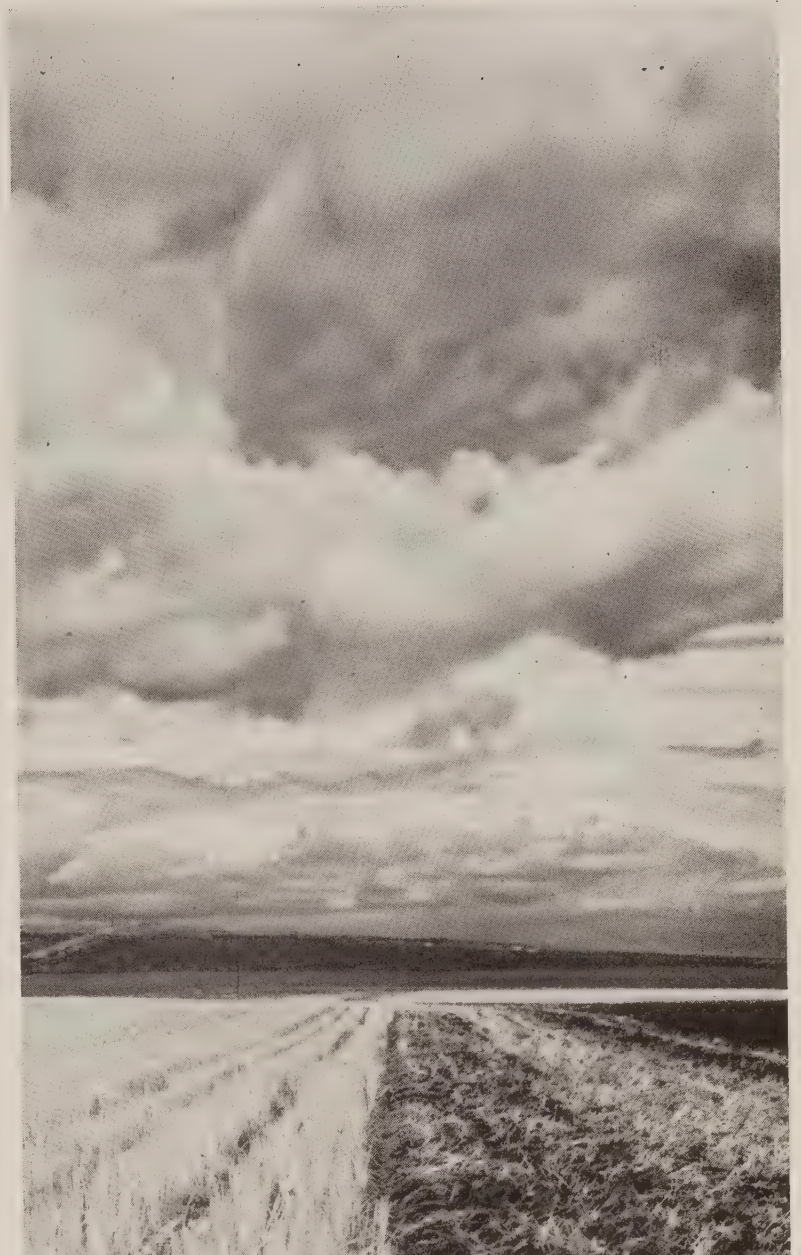
As has been pointed out, there are many areas in the United States that are no longer suitable for profitable agricultural production, due to unsound

land uses and a lack of soil conservation practices. It has been found desirable and economically feasible to the impoverished people living on such areas and to the welfare of the nation, for the government to purchase 212 such areas, comprising 147 land utilization projects, which contain over 10,000,000 acres. Of the total, the Soil Conservation Service manages 3,228,000 acres directly; 3,900,000 acres are managed through local agencies; 1,101,000 acres are handled under state management with Federal agencies as custodian, and the remainder, approximately 1,765,000 acres are directed by other Federal agencies.

Some of these project areas are being used by our armed forces for training purposes. Many have been converted into recreational parks, with club houses, cabins, fishing and boating lakes, trails through the woods and along the streams. Many of the former scars of erosion and improper land use have been covered up with growing vegetation. Permits are issued to farm operators who live near these projects for grazing, haying, cropping and the removal of forest products from certain fields that remain suitable for such purposes. In time, with the use of soil conservation practices, much of the land contained in these projects will again be making a major contribution to our national ecocnomy.

City folks understand better now, during these days of rationing and work in 20 million victory gardens, that the food they eat comes from the soil. Farmers and city people need each other's help, and mutual cooperation between them is fundamentally helpful. Large industries have become particularly interested in the conservation job, as demonstrated by publications and by the infiltration of soil and water conservation into advertising. Newspapers, periodicals, and magazines give more space to the subject of conservation. Equipment manufacturers are developing new and more satisfactory tools for conservation farming. State and county officials, bankers, lawyers, doctors, merchants, and businessmen are offering interest and support. Colleges, schools, churches, garden clubs, sportsmen clubs, and many other groups and organizations are beginning to rally to the cause of conservation. Even more significant is the action that farmers have taken in applying soil conservation practices on their farms and in helping their neighbors establish needed practices on the land. More farmers are beginning to realize that conservation farming is good farming—good business.

Soil conservation practices are spreading on the land as you can see from the few facts presented here, but the conservation job which must be done has only begun. In the future, the solution of our national land problems will be achieved largely through



Effective vegetative control: Crop residue.

conservation farming. Each community, each farm, must plan—chart its own course of action—on the

(*Continued on page 255*)

TRAINING SCHOOL TO SUPPLEMENT APPRENTICESHIP

By H. C. DIENER

One of the major problems presented by the war is how to keep the home front actively supporting the armed front. Manpower is scarce and growing scarcer, and in the field of food production as in many others, it is necessary to resort to every possible device to make the best use of the resources available.

The Soil Conservation Service long ago converted to a war basis. Now to meet a shrinking supply of personnel it has cut red tape, eliminated waste motion, and reduced urgent necessities and procedure of getting food-producing, conservation practices applied to land.

The manpower situation, always acute in the expanding district program, is made doubly so by the demands of the armed services. Our field staff of healthy, well trained, young men is being used by those forces for map reading, engineering and technical work. We have lost to the military service more than 2,700 persons, approximately one-third of our total employees. Replacement is difficult, and a term of apprenticeship is hardly practicable in view of the pressure for service in the field.

New recruits are added to the Service at an approximate rate of 100 per month. It is obvious that these new recruits are unlikely to have the basic training necessary to fill adequately the positions that are waiting. Personnel trained in basic subject matter such as agronomy, agricultural engineering, forestry, biology, farm management, and allied agricultural fields are not being poured out of our colleges. The armed forces are greatly depleting the student bodies. The pool from which the Soil Conservation Service formerly drew employees is not almost a dry well.

In the past a period of 6 to 12 months elapsed before full competence and production was reached by new soil conservationists. If we can reduce this period to but a few weeks we will have made tremendous strides in solving some of our problems.

Training schools have been mentioned as an important means of achieving the shortening of apprentice time. Training schools? Immediately the fundamental conservative offers a dozen objections. Where are the necessary funds? Who will make up the teaching staff? Is this system the most economical manner of producing productive personnel? We recognize that there are costs in conducting a school; however, if a laboratory school can be developed where a short period of instruction and student time will result in a shortening of apprenticeship and in a large, quick increase of productive time, there is economy in the use of that school. Why not? The army could not think of sending men into the field for combat duty without thorough training. In mechanized warfare special schools have been found both economical and efficient.

Editor's Note.—The author is head, training section, Soil Conservation Service, Washington, D. C.

Lessons Learn

La Crosse training school enrollees
Wi

***Standing*—from left to right: Olin A. Cla ington, D. C.; Albert A. Klingebiel, La Frederick J. Reed, Pomeroy, Ohio; La Schindler, Coshocton, Ohio; Elmer R. M bridge, Ill.; Arthur J. Kelley, West**
***Kneeling*—from left to right: Dolph C Winona, Minn.; Dr. Harry C. Diener, W Wis.; George Dickinson, Spartanburg, McClellan, Upper Darby, Pa.; George A. training officer, Milwaukee, Wis.; Walte bosch, Goshen, Ind.; Matt R. Stimac,**

The Upper Mississippi region of the Soil Conservation Service has taken steps to use a training school as a remedy to the situation. It has established such a school at La Crosse, Wis., to give each new sub-professional and professional employee, employees promoted from CU and CAF to subprofessional or professional grades, and employees who are low in productive efforts, a good basic knowledge of soil conservation work.

A practice laboratory system is being used, under which a student has class work and then field work to try out by actual experience what he has received

on the Land

oil Conservation Service nursery at
n.
laven, Mich.; Chris O. Henderson, Wash-
s.; Robert A. Hendricksen, Alma, Wis.;
Daniels, Woodsfield, Ohio; Arnold H.
k, Albion, Ind.; Edwin H. Lewis, Cam-
is.; Maurice E. Heath, Ames, Iowa.
querque, N. Mex.; Henry A. Johnson,
n, D. C.; Charles J. Krumm, La Crosse,
Limburg, Lincoln, Nebr.; the late Allan
Houston, Minn.; E. J. Peterson, regional
y, Milwaukee, Wis.; William H. Vander-
e, Wis.; Peter A. Cailotto, Olney, Ill.

in the classroom. Field problems are conducted on some farms in the neighborhood, and as they are worked out by the class and the farmer the result becomes the farm conservation plan for that particular farm. There are 15 class-room days, and 13 days in the field. The time is so utilized that the trainee acquires a good basic knowledge of the organization, purpose, and objectives of the service. Erosion studies, soil, moisture, plant relationship, land use, and land adaptabilities are given careful attention. Engineering, farm planning, farm management, field arrangement, crop rotation, crops, woodland and wildlife management are approached from the practical angle of the farm as a business proposition. The Soil Conservation Service nurseries are studied from research trial and capacity production angles.

La Crosse offers many special advantages to the success of a venture such as this school. The Soil Conservation Service experiment station, operated in conjunction with the University of Wisconsin, offers a unique opportunity to see the results of experimen-

(*Continued on page 255*)

LA CROSSE SCHOOL AFFORDS SOUND TRAINING

By R. H. MUSSER

"Just call me 'Sonny'. * * * I've just been released from the Navy because of injuries, after a year and a half patrol duty off the Atlantic coast. I'm a graduate of Virginia Polytechnic Institute with a major in agronomy. * * * This job with the Soil Conservation Service is my first civilian job since graduating from college."

"You can just call me 'Chuck'. * * * For the past 2 years I've been teaching agriculture in a high school in South Dakota. * * *"

The first speaker was Ambrose Hinson, new soil surveyor at Vincennes, Ind., and the second was Charles Livingstone, junior conservationist at Mauston, Wis.

They were among the 12 trainees who had reported last summer for first Soil Conservation Service training school at La Crosse, Wis. E. J. Peterson, regional training officer, Milwaukee, had asked each man to introduce himself and tell something about his training and experience.

The other 10 introduced themselves as having had experience as county agents, Smith-Hughes agricultural teachers, or as recent graduates of college engineering or forestry.

"For the next month you men are going to be extremely busy men," advised Mr. Peterson, following the introductions. "We are here for just one purpose. That is to enable you men who have had a wide variety of background, experience and education a chance to get the basic information you need to become good soil conservationists—or better soil conservationists. In this short period that we will be together, you'll have a chance to get a good basic understanding of the relationship of soil, water, wind and plant life to each other and to the problems of land use, soil and moisture conservation so that you will have a firm foundation on which to build your career.

"Let's review briefly the course of instruction you are going to take. Ten days will be spent on soils, plant relationships, and land capabilities. In that time we'll discuss in the classroom soil formation, structure, chemical composition, soil drainage, soil classification, and other theory concerning soil. We will then spend about 6 days in the field studying

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Editor's Note.—The author is regional conservator of the Upper Mississippi Region, Soil Conservation Service, Milwaukee, Wis.

soils. That will include your making a soil conservation survey of a farm. By the time you have finished your course in soils I'm sure A. A. Klingebiel, field party chief, your instructor, will have given you a good foundation in the subject which will help you in all your future work.

"Your work in engineering will be taught by M. M. Culp, design and construction engineer, who will discuss water disposal systems. J. C. Trieloff, or "Jim" as you'll soon know him, the engineer on the experiment station here at La Crosse, will spend 4 days with you, some on the study of hydrology but most of it in the field on the care and use of survey instruments and actual practice in making field surveys.

"Erosion experiment data will be discussed during the 16 hours you spend with Orville Hays, director of the La Crosse soil conservation experiment station. During that period he will take you to the station to observe and study the experiments at first hand.

"You'll study the effect of conservation planning on the farm business under H. O. Anderson, director of economic research for the Soil Conservation Service, La Crosse, and his assistant Don Mitchell. That will take about 20 hours.

"You'll find out how forestry, wildlife, and nursery work fit into the soil conservation program from Charles Krumm of the La Cross experiment station, and Maurice Heath, Thor Bergh, and Henry Johnson of the nursery division. One day will be spent at the Winona nursery to familiarize you with the field work of the division.

"To round out your technical training you'll spend 6 days with Art Kelley, farm planner of the La Crosse County Soil Conservation District, West Salem, who will explain farm planning, field arrangement, crop rotations, and who will assist you before you are through in actually planning 2 farms in this district. Incidentally, there are 405 farmer-district plans in La Crosse County, not to mention the fact that there are over 400 farmers in the old Coon Valley project located only 20 miles from here, where farmers have been practicing conservation for the last 10 years. You will have ample opportunity to see how soil conservation plans really work on the land.

"For the next 3 days I'll spend 9 hours with you discussing the organization of the Department and the Service, our relationship with other agencies, the Service's relationship to soil conservation districts, and personnel matters which are of vital interest to you and to your family."

During three school periods or courses, each lasting 1 month, the Upper Mississippi region graduated 34 men from this new training school at La Crosse. Previous to starting the school last summer we had experienced some excellent results through using the training school idea to develop conservation surveyors. Under the direction of the conservation surveys division more than 150 conservation surveyors had been trained under the personal supervision of A. A. Klingebiel, field party chief. The surveys division found that they could put a man on production mapping after 6 to 10 weeks of concentrated training at the school and get a much higher production and quality of work than they had formerly experienced in assigning soil surveyors to experienced field men for individual training.

Using that experience, it was felt that the same results might be obtained by giving all technical employees a basis training course instead of assigning them to field stations for training as had been done in the past. The school is open to both professional and subprofessional men.

School started again on March 20, and will continue throughout the summer months. The results of last summer's schools have proved beyond a doubt that the Service will greatly benefit by assigning every new technical employee who comes into this region to the training school at La Crosse. The school has proved a life-saver in training "green" inadequately trained or inexperienced employees such as the Service frequently has to take because of the wartime manpower shortage. It has proved equally effective in improving the value of employees who have been with the Service for several months or years.

Experience gained in the La Crosse training school will enable us to develop a similar school where employees returning from the armed forces can reorient themselves and become acquainted with the new information and methods developed while they have been serving their country elsewhere. This will be especially helpful in enabling Service employees to resume their careers with a minimum of loss because of being out of touch with their technical fields.

The job of training is not done, however, when an employee completes the course at La Crosse. Both old and new employees need further training under their supervisors in educational methods, public speaking, fundamental technical information, and the new information and methods acquired through research and field trials. Additional technical training is especially important for those who fill specialist positions in the various technical fields.

The value of the new training school is shown by the fact that the course has been appraised as being equivalent to 10 credits of university work. The Service personnel division takes this into full account. To many of our employees who lack the basic qualifi-

ations for a P–1 rating, completion of this course has been a means of attaining a professional rating. Thus, training has been tied in with our promotional policy.

Comments of the men completing the course also indicate its value more clearly than anything else. I talked to a number of these men the last few months and I recall that Mr. Hinson told me he considered the course extremely important not only for the basic information it gives but also because it stimulates thinking. He pointed out that the P–2 men who usually have to train the newer employees are under so much pressure to produce farm plans and other work that they do not have the time—some don't have the patience—to teach their subordinates many of the primary and fundamental things they need to know. They teach them just enough to do the immediate job. The new employee under such a situation can easily form bad habits and form erroneous conclusions.

Nicholas Calebresa, conservation aid in the Adams County Soil Conservation District, Friendship, Wis., after 2 months experience with the Service told me:

"I learned a good many of the fundamental facts which help me understand why we do many of the things we do. The school helped me understand the relationship of theory to practical application. This knowledge all helps a fellow do his job better, gives him confidence to go ahead and plan a farm."

Perry Carroll, Baraboo, Wis., junior soil conservationist in the Sauk County Soil Conservation District, who has had several years experience as a senior foreman and in other positions in a CCC camp said that when he first started work in a district he found himself "floundering" and that after 10 months he didn't have all the fundamentals which he obtained in a short time in the training school. As he said, "This training school helps put you at peace with yourself and your job."

(*Continued from page 253*)

tal research applied on a practical, paying dairy farm. The Service staff at this station is a valuable part of the school's teaching staff. A complete county soil conservation district in La Crosse County has farm planners who can be used for instructors with very little time lost from their regular jobs.

The oldest Soil Conservation Service demonstration project in United States, Coon Creek, furnishes examples of conservation measures which have been in effect for more than 10 years, and the soil conservation training school for soil surveyors has been located in La Crosse. The Soil Conservation nursery at Winona, Minn., and the economic research work at La Crosse, tend to make this an ideal location for a training school because of the exceptional physical facilities and the excellent faculty at hand.

The training school is under the jurisdiction of the regional office at Milwaukee. It is closely supervised by E. J. Peterson, regional training officer, who also gives time to instruction in orientation. H. H. Klingebeil, who has been conducting a school for soil surveyors, is the local supervisor of the trainee group and administrator of the school.

The faculty changes from time to time. The major portion of the instruction is given by technical and administrative men located at or near the school. This makes it possible for these men to carry on their regular duties with little time lost. Each teacher spends not more than one to nine days with the classes. After the initial schools have covered the field rather thoroughly it may be necessary to hold later schools only as needed—perhaps quarterly to orient new employees or to reemphasize basic considerations to older personnel with low production records.

When the employees leave this training school they are not considered finished soil conservationists, but they do have a solid foundation. They know Service objectives and purposes, and the interrelationships of techniques, sufficiently well to adapt themselves quickly to building conservation into practical, everyday farming.

The Upper Mississippi region also is gaining the experience needed to reorient the returning conservationists from the army and to handle many post-war situations. Like conservation farming itself, the training schools pay now and provide for the future, too.

(*Continued from page 251*)

basis of land needs and economic circumstances and then execute the plan. This will require cooperative efforts of everybody and the technical assistance of experienced soil conservationists.

Urban interests and farmers share equally the responsibility for the spread of soil conservation. The necessities and conveniences associated with a good standard of living—which make each community a better place in which to live—can be provided through conservation farming.

All other business depends on the business of farming. Therefore, it is imperative that the farmer—as the guardian of our basic resource, our productive land—be assisted at all times. Without productive land, we cannot have a permanent agriculture, and without a permanent agriculture this nation cannot survive.

There are two indices of the desirability of fairly heavy trapping in this marsh. Numerous houses and the intensively grazed vegetation point to a large population of muskrats.

FUR FROM FARM LANDS

By PHILIP F. ALLAN

Part I

The wild fur-bearing animals have always played a role in the economy and development of the Nation. No less today than in the coonskin-cap era do fur bearers help clothe our people. The earliest explorers of the West were trappers, many of whom, like Kit Carson, became the guides to those who started the pioneer agriculture in the Louisiana Territory, the Great Basin, and the West coast.

For many years so intent was the Nation on producing cultivated crops and domestic animals that wild crops suffered from lack of attention; and, what was worse, from misuse of the land. Today we know how to produce vast yields of crops on lands best adapted to cropping. The conservation of soil and moisture and the adaptation of crops to the types of land most suitable for their production tend to restore to wild animals a place to live. The fur bearers, fish, and game are finding a place in diversified agriculture and in no small way are contributing to farm income.

Today the part that fur bearers are playing in American history lies in their yields of fur, fat, and food. No nation engaged in modern warfare can afford to overlook any source of weapons, whether military or economic.

Editor's Note.—The author is senior biologist, Biology Division, Soil Conservation Service, Washington, D. C. The second part of this article will appear in the June issue.

WARTIME VALUES OF FUR BEARERS

Wartime conditions have made it important to utilize all sources of food and other useful products of the land. Fur-bearing animals that can be produced on farm lands provide furs useful to the armed forces and civilians alike. Members of the United Nations' merchant marines, war workers constructing the Alaska highway, and civilians on war jobs in Alaska, Greenland, and Iceland, use fur garments. The Army uses wolf and raccoon skins to a limited extent for linings of high-altitude and arctic garments and is testing a number of other furs for more extensive use.

Trappers and hunters are being urged by State conservation departments to save fat from animals. Enough glycerine can be obtained from 100 pounds of ordinary animal fat to make 25 pounds of nitroglycerine. Some fur bearers also supply considerable quantities of palatable food. Muskrats and raccoons are sold for food and many opossums are eaten. It is estimated that half of the muskrats taken annually could be utilized for food, thereby providing 2,000,000 pounds of savory meat. If only a third of the opossums were in an edible condition when taken, they would provide 3,000,000 pounds of meat, and half of the 600,000 raccoons would provide 1,500,000 pounds of food.

Furs are an important wild product of agricultural land and provide a wartime crop from types of land often otherwise unproductive. Many parts of the farm contribute to their production, particularly areas not useful for cultivated crops, forage, or wood products. Protection of suitable fur-bearer habitats, along with other rather simple management measures, contributes to yields of the fur crop without the expenditure of a great deal of time and effort on the part of the farmer or rancher. On parcels of wildlife land, the production of fur bearers takes an important place along with the management of those lands for edible wild fruits, honey plants, and the development of ponds for a handy supply of food fish.

Stream and drainage-ditch banks, marshes, swamps, overflow lands, lakes and ponds, hedgerows, rock outcrops, old strip mines, abandoned quarries, cliffs, and box canyons dot the farms and ranches of the Nation. Although they often are considered "idle" or "waste," they are in fact wildlife lands.

By virtue of numbers taken annually, the most important of the fur bearers are (1) muskrat, (2) opossum, (3) skunk, (4) raccoon, (5) mink, (6) weasel, (7) fox. The first five are most susceptible to increase through land management. Their abundance (table 1) and widespread distribution also permit broad, general recommendations. Some other farm fur bearers which may be increased by land management practices are discussed briefly.

Annual fur harvests in the United States

Region	Muskrat	Opossum	Skunk[1]	Raccoon	Mink	Total
	Thousands	*Thousands*	*Thousands*	*Thousands*	*Thousands*	*Thousands*
Northeast	3,027	248	569	79	32	3,955
Southeast	340	594	255	149	56	1,394
Upper Mississippi Valley	3,123	710	733	141	201	4,908
Southern Great Plains	2,262	1,685	478	201	126	4,752
Northern Great Plains	437	172	562	22	24	1,217
Southwest	(2)	(2)	(2)	(2)	(2)	(2)
Pacific Coast	132	1	34	11	14	192
Total	9,321	3,410	2,631	603	453	16,418

[1] All species.
[2] No estimate.

An opossum.

FARMS AND FUR BEARERS

Farm lands in the United States produce more furs than forests and wilderness, acre for acre, and the wildlife lands on inland farms sometimes outyield even the coastal marshes.

The fur animals, although they may range the woods for beechnuts, dig pasture grubs, or eat waste corn, generally make their homes in little-used parts of the farm. As the ordinary practices of farming encroach upon wildlife lands, the numbers of fur bearers diminish. The grazed stream bank, for example, supports few muskrats, minks, and raccoons, but well-protected stream banks are favored by these animals (fig. 1). The stream margin, in fact, is one of the most productive fur-bearer habitats on farm land. It is sometimes rivaled by ponds, well-vegetated drainage ditches, and woodlands.

Often simple developments, designed to control erosion or to put other land to better use, make wildlife land habitable to fur bearers. Annual yields comparable in value to those of arable lands are not unusual on the wildlife land of the country. Consider a farm pond that produces $10 worth of fur per acre in addition to other uses at no outlay beyond the time and small expense of trapping. One published record shows 75 cents per hour return after costs of traps and other expenses were deducted—$97.50 profit from each $100 worth of fur taken.

HOW TO IMPROVE LAND FOR FUR BEARERS

A woodland or an orchard will produce some timber or fruit with no management at all. As the care these areas receive becomes more intensive, the yields become greater. Wildlife lands with no management now produce most of the Nation's fur crop, but the improved marsh may yield two or more times more pelts than an unmanaged marsh. The following management measures, listed in approximately increasing complexity, indicate how various kinds of land may be managed to increase the number of farm fur bearers. Few farmers are likely, at present, to manage a single species intensively enough to justify the presentation of material on muskrat management or mink management even if biologists knew how. Many, however, are prepared to manage their land, about which much is known, if they can do so economically and realize a profit on their investment.

If only the simplest measures are applied, increased yields of furs will generally result. Whether the land is in marsh, rock outcrops, gullies, or woodlands the easiest practices to apply are the protection of the vegetation from uncontrolled fires and from grazing by livestock. These lands can be protected from fire by refraining from burning them entirely or by burning only when conditions are suitable. Accidental fires should be put out, and firebreaks may be plowed or established by controlled burning or ditching at suitable locations. Grazing is most effectively controlled by fencing, but if areas are to be grazed, livestock numbers should be limited to reduce damage to food supplies and burrows of fur bearers. In the case of streams and ditches the conversion of adjoining lands from pasture to crops will provide protection where those lands are suitable for crop production.

Trappers would look in vain for fur bearers on a raw-banked stream, but with protection of the banks from livestock damage and with the prevention of rapid runoff the stream becomes suitable for muskrats.

MARSHES

Practice controlled burning.—Controlled fires are useful in maintaining desired types of vegetation in some kinds of marshes. This kind of burning also permits greater freedom of travel in the marsh and is thought by some to produce greater growth of vegetation. Marshes should be burned only when accumulations of dead plant litter are sufficient to fill shallow water areas to the point where these areas are not readily usable by muskrats.

At the time of burning, the ground should be saturated with water, and plant crowns, rootstocks, or other reproductive parts of the plants must be sufficiently covered with water not to be killed. Fires are more easily controlled when winds are light or when the weather is damp. There should be an adequate system of firebreaks and sufficient help to keep the fire under control. Muskrat houses should be protected and scattered clumps of vegetation left unburned for animals to use as cover. Controlled burning is not of any particular benefit to fur bearers other than the muskrat.

Construct ditches.—Ditching opens the marsh to muskrats, provides somewhat greater uniformity of water distribution, and supplies spokl banks in which muskrats burrow. Ditches can be made in many ways. Blasting is one of the fastest and cheapest ways of ditching and, if properly done, will leave spoil banks. Propagating charges of dynamite permit the construction of long ditches at one time. Draglines likewise are used as a fast and relatively cheap ditching method. This method also provides spoil banks. Sometimes a special turning plow or ditcher and a marsh tractor are used in large marshes, and the earth removed from the ditch is piled on either side. In small marshes a horse-drawn or tractor-drawn slip scraped may be used, and hand-dug ditches can be built if one has the time. Sometimes special excavators are used on the coastal marshes.

Ditches in the North may need to be 3 to 4 feet deep. Shallower ditches 1½ to 2 feet deep are suitable in the South. They should be at least 2 to 3 feet wide and have a 1 to 2 foot spoil bank (banks on both sides are most desirable). In places likely to be flooded, spoil banks should be high enough to afford refuge for fur bearers. High spoil banks of peat, however, are likely to dry out and be destroyed by fire. Usually ditches should have no grade or should be blocked at intervals to prevent drainage. The most suitable pattern for ditches will vary with the site (fig. 2), but the most desirable distance between small ditches ranges from 50 to 150 feet. Large ditches, up to 16 feet wide and 4 feet or more deep, are sometimes used in the coastal marshes but they are expensive. In the average marsh on farm land the small ditch is most satisfactory.

Muskrats, minks, and raccoons benefit from ditching the marsh.

Control water levels.—Water-level control is usually handled by dikes or by levees and gates. The water table is maintained at or near the ground level. The methods of flooding marshland are by damming, diverting water from streams, or pumping water from nearby lakes or rivers. Engineering assistance generally will be needed for the installation of water-control devices. All of them are likely to be expensive, and the cost may not be justified unless

returns from furs can be depended upon.

The muskrat principally benefits from water-level control.

STREAMS AND DITCHES

Develop and maintain vegetation on the shores.—As pointed out previously, the easiest way to develop and preserve the vegetation is by protecting it from livestock and from fire. On the banks of streams and ditches marsh and shoreline plants or shrubs such as rushes, arrowheads, cattails, barnyard grass, and bush willows may be seeded or planted. Where trees cause bank cutting or shade out desired shrubs, grasses, or rushes, they should be cut. However, den trees (8 to 10 per mile) and fruit-producing trees and shrubs such as persimmon, pawpaw, plums, and haws, should be preserved along the streams.

Plantings will benefit muskrats. Den trees and fruit-bearing plants are useful to raccoons, opossums, and skunks.

Build stream-protecting structures and dams.—Small dams are used on small meandering streams to create marshes in low spots. Erosion-control structures of loose rock, log cribbing, or piling may provide den sites for minks. Structures on streams generally require careful building and should be constructed with the advice of engineers. Dams built by beavers will improve streams for other fur bearers. The principal fur bearers benefited by dams and other structures are muskrats, minks, and raccoons.

LAKES AND PONDS

Establish herbaceous vegetation on the shores.—As with streams and ditches, the first step in improving lakes and ponds is to develop and maintain suitable vegetation. Here herbaceous marsh and aquatic plants are most desirable. They may be established by protection of the shores from livestock and prevention of burning, by seeding or planting of desired species, and by the removal of unneeded trees and other competing plants. All the farm fur bearers discussed find such vegetation to their advantage.

Make shallows in strip-mine ponds.—Shallows in strip-mine ponds are needed for the development of vegetation, and they may be made by concentrating runoff water at suitable locations to form deltas or by bulldozing or scraping earth from the spoil banks. Acidity or a poisonous condition of the water may prevent plants from growing readily. Liming or other treatment may be needed to offset this condition. Muskrats, minks, and raccoons are common along well-vegetated strip-mine ponds.

ROCK OUTCROPS, GULLIES, BOX CANYONS

Establish vegetation.—The simplest protective measures usually are sufficient to develop and maintain vegetation, but sometimes it is necessary to build diversion structures to prevent rapid runoff of water through gullies and thus enable plants to get a foothold. Suitable herbaceous or woody food and cover species may be planted although they are seldom needed on rock outcrops such as knolls, cliffs, and escarpments. The fur bearers usually benefited by treatment of these areas are skunks, opossums, and raccoons.

CROPLANDS AND PASTURES

Develop hedges and field borders.—Fur bearers frequent hedges and field borders and if the hedges contain fruit-bearing shrubs the animals will utilize the fruits. Ordinary management such as cutting out large trees, particularly if it maintains the hedge or border in shrubby and perennial herbaceous growth, is all that is needed. These areas should not be burned.

Develop odd corners. Small rock outcrops and odd corners which cannot be cultivated are common in cropped fields and in pastures. If these outcrops and corners are borders, the vegetation most suitable for fur bearers ordinarily will come in. Field stones, stumps, and brush may be disposed of there in piles to the benefit of such fur bearers as skunks, opossums, and raccoons.

Develop permanent vegetation on drainage and irrigation ditches.—Burning is commonly practiced to control weeds along drainage and irrigation ditches on cropland. This harmful practice is a sure way to maintain weeds because perennial grasses and other useful plants cannot become established. Weeds should be mowed each year before seed matures until permanent vegetation comes in. Grasses, legumes, or other plants may be planted to assure a growth of desirable species. The fur bearers benefited by this practice are muskrats, minks, and skunks.

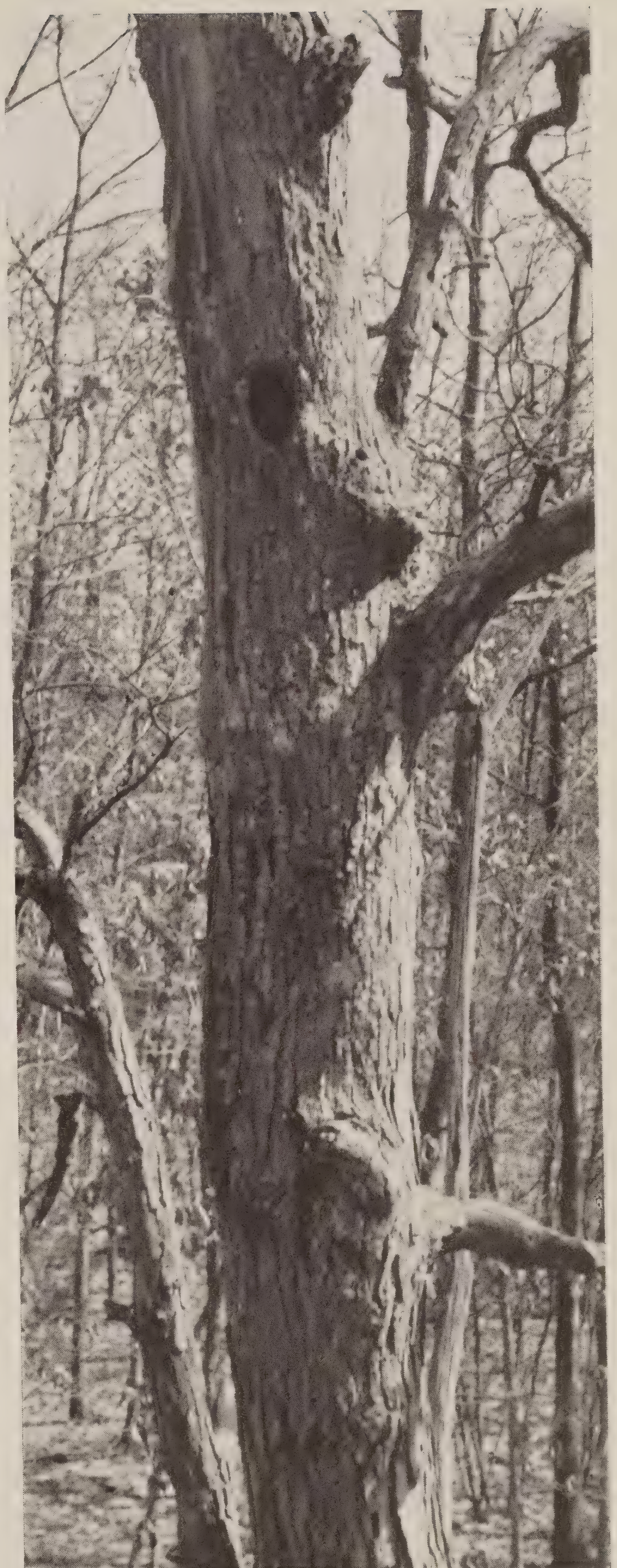
WOODLAND

Practice woodland management.—Raccoons and skunks, and in some instances, other fur bearers are generally more abundant in ungrazed than in grazed woods. Any of the measures recommended as good woodland management such as selective cutting, timber-stand improvement, and prevention of fire will prove beneficial to fur bearers.

Develop shrub borders.—Fur bearers show a marked preference for woodland edges. If the woodland has a shrubby border, the food and cover plants are much utilized by wildlife. Releasing shrubs by cutting out trees where they encroach on fields at the wood's edge for 15 to 30 feet is one of the simplest methods of producing shrub borders. Desirable species of shrubs may be planted. Skunks,

raccoons, and opossums usually will be found along woodland borders.

Leave den trees and potential den trees.—Probably the most important single measure for raccoons is protection of their den trees (fig. 3). These are commonly cut by 'coon hunters or by farmers because the tree has little timber value. Since it requires 70 or more years for a den tree to develop and 25 or more years for the cavity to form it is short-sighted to cut it to remove raccoons. Furthermore, it is sometimes equally poor economy to cut a useful den tree for woodland improvement, because the tree may produce a greater value in furs than its wood and space are worth annually. One den tree per 10 to 15 acres will maintain a good population of raccoons. About twice as many trees which show signs of becoming den trees should be preserved. That is, 1 per 5 to 7 acres. Thus, there will be ample replacement for dens no longer useful. A thump with an ax will reveal hollow tree trunks and branches, in which a hole may be chopped to open the tree for denning. Raccoons and opossums will benefit from the protection of den trees.



The principal factor in maintaining raccoons is the preservation of den trees. It takes years for a den to develop in a tree, so it is a good policy to spare them from cutting and to preserve those which show prospects of becoming den trees. (Photo courtesy Mich. Cons. Dept.)

DISTRICT FARMERS TAKE HONORS

Fifty-nine counties in 21 States are announced as winners of the "A" banner awarded by the War Food Administration in 1943.

Forty-one of these counties—70 percent—are in organized soil conservation districts.

The "A" banner constitutes national recognition of outstanding agricultural achievement on the part of the farm families of the counties. State War Boards, in selecting counties to be nominated for the distinction, gave consideration to the following items: (1) Production record and extent by which county exceeded year's goals; (2) crop shifts of an unusual and significant nature to vital war enterprises; (3) overcoming problems and handicaps to production; (4) increased efficiency brought about through higher yields per acre after adoption of soil conservation practices, care of livestock, sound farm management; (5) fuller use of land and labor resources, particularly by increasing production, putting idle land into production, and getting full use of potential land and labor resources.

CHARTS TELL DISTRICT'S PROGRESS

By J. F. COLE and T. W. WEBB

With the Edisto Soil Conservation District in South Carolina, it's system that counts.

Ask the supervisors of the Edisto District how their work is progressing and they can tell you in a hurry. Not with words, but with charts that show exactly how far each district cooperator has progressed in establishing conservation practices under his farm plan.

Each work unit has a chart, keeps it up-to-date. At the top, clear across, are listed the principal conservation jobs—improved rotation, strip rotations, planting kudzu and sericea, terracing, water disposal, pasture improvement, reforestation, woodland improvement. At the left appear the names of the district cooperators. To the right of each name and extending across the chart are a series of spaces for each of the conservation jobs listed at the top of the chart.

To find out, for example, how much pasture improvement work a cooperator, whom we will call Sam Williamson, has done, all that is necessary is go down the list until his name is reached. In Williamson's block headed "pasture improvement" is the figure 47—the acreage called for under his farm plan. Half of the block has been colored with crayon, indicating that half of the pasture work has been completed. Checking further, it is seen that Williamson has half of his terracing done, a fourth of his improved rotations established. In view of the fact that he has had his conservation plan less than 2 years he may be credited with doing a good job of establishing practices.

The chart will also reveal any practices that are lagging. This is indicated by too many white or little-shaded blocks. An abundance of white space, especially for a district work unit that has been in operation for some time, may reflect oversight on the part of the work unit technician or unfavorable local conditions that prevented farmers from going ahead. Either way, the white blocks are "sore spots" to the supervisors of the Edisto District and a warning that something must be done about them.

In one work unit in the Edisto District the white blocks under pasture improvement stood out conspicuously. Now there are fewer white blocks in the pasture improvement column.

One factor that had been hampering pasture improvement in the Edisto District was the lack of rotary lime-spreaders. Much land in the district is acid and liming is necessary to a good pasture. The supervisors bought five rotary lime spreaders and by the end of April 1943, more than 5,500 acres had been limed. Cooperators who use the spreaders pay the district 50 cents a day as rental, and as receipts accumulate the supervisors buy more spreaders or other equipment that can be used in advancing the district's conservation program.

When the charts were first worked up in the Edisto District showing how much practice establishment had been completed, they were taken to the district supervisors. "Now those charts are all right since they show us some of our weak points, but what are we going to do about it?" commented J. D. Prothro, district chairman.

It was decided that each work unit should set up a definite goal for the coming season. But the supervisors did not stop there. Each called together the farm leaders in their home communities and asked them to help. This was followed by another meeting at which the supervisors trained the leaders so that they could give direct help to farmers. In each community an assistant district supervisor was named. All told, the district now has 20 assistant district supervisors. One of them in beginning his work said, "I have often wanted to do something like this for the district, but didn't know just how to go about it. I always felt that some of us could help, as the job is too big for you folks to do by yourselves."

At the end of the season a check was made to see how nearly the goals had been approached. In practically every work unit it was found that more progress had been made than had been anticipated.

It was found that dovetailing the work of establishing practices with the conservation needs as revealed by the charts enables the work unit technicians to make far better use of their time. It also saves travel, as the technician can plan his trips so as to serve more farmers on each swing.

Other South Carolina districts are also finding the charts helpful in systematizing the spread of conservation.

EDITOR'S NOTE.—The authors are district conservationist, Soil Conservation Service, Aiken, S. C., and assistant State conservationist, Soil Conservation Service, Columbia, S. C.

Any To Spare?

Out of print and hard to obtain is Technical Bulletin 524, titled Silting of Reservoirs. Written originally by H. M. Eakin and revised in 1939 by C. B. Brown, this publication is greatly desired by the U. S. Army. Anyone having copies that can be spared is requested to return them to the publications unit, Soil Conservation Service, Washington, D. C.

NOTE ON FEEDING BLUEGRASS

Some years ago Dr. R. L. Humphrey of Round Hill, Va., took charge of the McLean race horses at Leesburg, Va. They were not winning races although well fed and trained. He took blood samples and Johns Hopkins found that all were deficient in calcium and phosphorus. Dr. Humphreys limed and fertilized the pastures and took blood samples again in 90 days. The man from Johns Hopkins drove to the farm to find out how he had brought up the calcium and phosphorus content of the blood in every case.

The previous year McLean won $43,000; *that* year $85,000; the *next* year $124,000. The doctor's contract was out, and in the next 2 years no more fertilizer was used and winnings dropped back to $45,000. That was on "good" bluegrass that people said needed no fertilizer! Results with dairy cattle work out about the same way.

——*Arnold G. Ingham.*

OVER THE TOP—Again

At a time in our history when everyone, in every job, in every part of the Nation, must take part in the fight for victory over our enemies—and when everything we do must contribute to that fight—I am proud to report that the men and women of the Soil Conservation Service met their responsibilities in the Fourth War Loan. We went over the top; we invested $830,948 in War Bonds; and we came through with the splendid record of attaining 141.1 percent of our assigned quota.

While I tell you I am proud of this outstanding record of the men and women of this Service, I am sure this must be minor by comparison with the sense of effective participation which each bond investor must feel individually. Our dollars are also fighting this war. If our record in the Fourth War Loan is an achievement, let us still not rest. Even more is going to be needed.

——*H. H. Bennett.*

SUPERVISORS SET PACE

Supervisors of the Edisto Soil Conservation District in South Carolina practice what they preach on the 14 farms they themselves are operating under district agreement.

J. E. Cole, district conservationist, reports that a recent analysis shows that 65 percent of the planned practices have been established on the 14 farms. These include 352 acres of kudzu and 212 acres of sericea lespedeza established, 892 acres terraced, crop rotations set up on 1,000 acres, and 117 acres of pasture seeded and improved.

REVIEWS

RANGE AND LIVESTOCK PRODUCTION PRACTICES IN THE SOUTHWEST. U. S. Department of Agriculture Miscellaneous Publication No. 529. Washington, D. C., November 1943.

Here is a wartime publication, prepared jointly by several agencies solely for the livestock industry of the West. Simply presented, and intended as a handy guide for rangemen, the bulletin reflects years of study and experimental work on the part of many scientists. Undoubtedly this particular piece of cooperative work is an omen of happier days ahead for the vast grazing lands of our country.

The new bulletin carries 10 signatures, each that of a noted range or livestock specialist. The specialists represent 8 Federal and State agencies: the Indian Service, the Grazing Service, and the Range Development Service of the Department of the Interior; the Soil Conservation Service, the Forest Service and the Triple-A of the Department of Agriculture; and the animal husbandry divisions of the New Mexico College of Agriculture and the University of Arizona.

The practical handbook consists of brief directions for managing the range and the herds for highest possible production without injury to the soil or to forage plants. It deals with summer ranges, year-long grazing areas, and procedures for determining the degree of use permissible to improve a run-down range or keep a good range in top condition.

Thesis of the bulletin is the close relationship between erosion control on grazing land, forage species and growth, control of herds and grazing, and livestock production as a permanent and profitable industry. About 30 photographs are shown to illustrate range rehabilitation methods and phases, desirable and undesirable plants and grasses, planting methods, erosion control and water conservation methods, and other steps in building back, utilizing, and maintaining those immense tracts of the West upon which the nation is largely dependent for meat, wool, and leather.

——*Phoebe O'N. Faris.*

He "Shot" the Cattle

The man who made that spectacular cattle-feeding picture which elicited so much favorable comment when it appeared on the front cover of the February issue has been located. From Hugh G. Porterfield, associate soil conservationist at Amarillo, Tex., comes the following explanation:

"I took this picture on the Liberal, Kans., demonstration project soon after it was started, when the value of windbreaks for livestock protection was being stressed. This was one of the 'old' established windbreaks in the area. Many windbreaks planted by the Service in past years on the High Plains are furnishing cattle this type of protection during the severe winter of 1943–44."

REFERENCE LIST ☆☆

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SOIL CONSERVATION

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JUNE 1944

SOIL CONSERVATION

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WELLINGTON BRINK EDITOR

CONTENTS

Front cover: A proud bird and a proud new agriculture! By combining two photographs, a result is achieved which symbolizes the determination of the Nation to defend the American land from the destroying forces of man and nature.

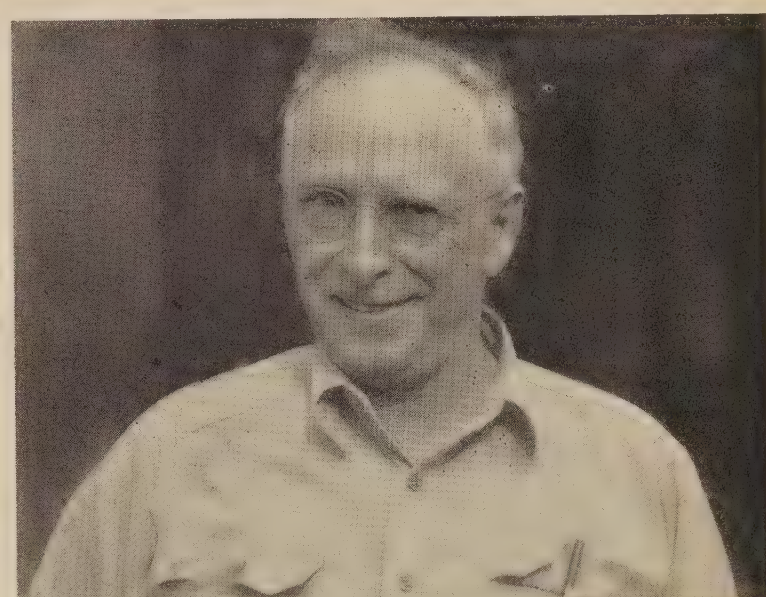
SOIL CONSERVATION is issued monthly by SOIL CONSERVATION SERVICE of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. SOIL CONSERVATION seeks to supply to workers of the Department of Agriculture engaged in soil conservation activities, information of special help to them in the performance of their duties. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., 10 cents a copy, or by subscription at the rate of $1.00 per year, domestic; $1.50 per year, foreign. Postage stamps will not be accepted in payment.

Range Conservation Pays Dividends

By ROBERT V. BOYLE

H. F. Prewitt, of Coolidge, N. Mex., has more than doubled grazing capacity, and made a reputation for range improvement. Prewitt's story, like that of many another successful stockman, is properly prefaced by some background information. His accomplishments, as a matter of fact, have come largely as a result of his own good understanding of the conditions which govern range use.

A typical southwestern ranch consists of uplands (mountains, hills, ridges, mesas) and bottom lands (alluvial valleys or floor plains). All the moisture that the uplands get is what rain falls on them—usually 7 to 16 inches a year. Bottom lands that haven't been gullied and drained, on the other hand, receive many times this amount of water because of run-off from above. They are, in effect, irrigated with each flood. It is not unreasonable to state that good native bottom lands can carry 10 to 15 times the number of livestock that a similar acreage of uplands can support. But many valleys are cut with gullies, and for that reason they "aren't what they used to be." Getting floodwaters back on the flat where they belong isn't easy. It isn't even practicable in some instances because the valley may be too far gone or because the arroyo is too big and carries too much water to tamper with. There are many other valleys, however, that are subject to restoration by means of water-spreading.



H. F. Prewitt, stockman of Coolidge, N. Mex., who has more than doubled the grazing capacity of his ranch through soil conservation practices.

In 1938, Prewitt, out of his own experience and what he had been hearing, decided that his bottom lands were not holding up their end of the range load. At that time, the Breece-Prewitt Sheep Co.,

Editor's Note.—The author is chief, operations division, Soil Conservation Service, Albuquerque, N. Mex.

in which Prewitt was a major stockholder, operated on something like a half-million acres. The area on which the company desired to try out range conservation "treatment" was near the headquarters on the north side of the Zuni Mountains. Prewitt solicited the assistance of the Soil Conservation Service. The 13,000 acres to be treated constituted a complete watershed. It covered the very head of the Rio Puerco of the West, a tributary to the Little Colorado. A highway and a railroad, both transcontinental, traversed the area. By January 1939 Prewitt and the Service had worked out a mutually satisfactory plan.

On the uplands, it was contemplated to provide a small amount of fence removal and fence construction, four stock tanks, to reseed 130 acres, to plant trees, and shrub in gullies and arroyos, to employ contour furrowing where adapted, to use brush spreaders above gully head cuts, to install road water bars and a few rock and brush gully checks.

On the bottom lands, comprising 1,178 acres, the plan included four diversion dams, main diversion and lateral ditches, protection dikes, contour dikes, masonry ditch structures, wooden turn-out boxes, contour furrowing, fencing, tree planting in washes and gullies, seeding of pasture grasses and legumes.

It was anticipated that the flood plains would produce much more forage than they had been producing in recent years, so the estimated rate of future stocking was set at 2,800 animal-unit months for the range unit, including both bottom land and upland.

It is well to repeat that it was Prewitt's own idea to do all of this. He wanted to lighten the range load on his uplands where there had been local concentration of stock. He wanted to bring back his bottom lands. Most important of all, he realized that water spreading was the equivalent of irrigation. He knew that irrigation meant installation of structures, labor to manipulate them, and maintenance to keep them serving his needs. He had established water rights. He backed up his judgment with a substantial investment in these improvements. Although at that time Soil Conservation Service had CCC and similar type labor which it used rather freely on demonstrational work, Breece-Prewitt ranch stood over half of the over-all cost.

The work was completed by early 1940, and the results of water spreading were beginning to show. It so happened that in this year the cooperative agreement became inoperative because of the disbanding of the Breece-Prewitt Sheep Co. Harold Prewitt and his wife, Hazel, retained most of the range, including the unit under discussion. They were no longer under any obligation to continue the conservation program. Did they drop any phase of it, or merely let matters rest? Far from it! Prewitt was so well sold on the productive possibilities of his flooded lands that he drilled four wells for irrigation. Three of these proved to be flowing wells. He also built a reservoir of 350 acre-feet capacity, with canals and ditches.

Prewitt disclaims being a farmer; but, being resourceful and foreseeing war shortages, he put 80 acres into crops—corn and beans—and 8 other acres into garden. All of this is irrigated.

This is how the home ranch unit shapes up now:

	Acres
Range land	12,000
Semi-irrigated pasture	450
Semi-irrigated hay-pasture	440
Irrigated hay-pasture	200
Irrigated cropland (40 to corn)	80
Irrigated garden	8
Total	13,178

The range and pasture land is used as follows: 4,500 ewes are lambed in the spring; hay grows up during summer and is cut during August, 700 steers are grazed during late summer and fall, and about 250 yearlings are wintered.

Actual feed production on the basis of animal-unit months (5 sheep=1 cow) is summed up as follows:

	Animal-unit months' feed
4,500 sheep-months' grazing equals	900
2,200 cow-months' grazing equals	2,200
270 tons hay equals	1,000
24 tons corn equals	158
Total	4,258

Prewitt estimates that, of the above, about 2,100 animal-unit months are represented by range land (uplands). The remainder, or 2,150 animal-unit months' feed, is produced by irrigated and semi-irrigated bottom lands. It is possible to irrigate only 240 acres whenever water application is necessary, ordinarily about three times during the growing season. Another 890 acres are semi-irrigated or floodwater irrigated; that is, they are watered only when the arroyos run. Without the diversion dams and ditches, this water would be going on down to dissipate, chiefly by evaporation, in the wide, sandy beds of the Rio Puerco and the Little Colorado.

The following is a comparison of present use on uplands and bottom lands, respectively: The 12,000 acres of upland range provide 2,100 animal-unit months' feed, or enough for 175 cattle year long. This means 68 acres per cow year long, or 5⅔ acres per animal-unit month. The 1,130 acres of irrigated and semi-irrigated bottom land provide 2,158 animal-

unit months' feed, or enough for 180 cattle year long. This means 6.3 acres per cow year long, or 0.52 acre per animal-unit month.

What is the production on this 13,000-acre unit of the Prewitt ranch worth in dollars and cents? That is hard to say. It can't easily be evaluated, because the presence or absence of such a spread could mean success or failure for the ranch as a whole. A highly productive range unit like this is the heart of an outfit, the "nursery" for lambing, the "hospital" for thin and crippled stock, the holding pasture for shipping time, and a number of other things. Nevertheless, here's an attempt to set down some gross figures:

1. 1,600 steer-months' grazing in summer and fall. Gain averages 2 pounds (or more) per head per day, which means 96,000 pounds of beef, and at 12 cents has a value of $11,520.

2. 1,000 steer-months' winter grazing (maintenance), with grass valued at 40 cents per head per month, means a value of $400.

3. Lambing on the unit has ceased to be a gamble. Because of sure feed, lambing sheds have been built. With the set-up, less labor is required. Counting all sheep, including drys, Prewitt gets a 95-percent lamb crop at marking time. He states that with assurance of these results it is worth $1 for each ewe turned in the area. Three bands, or 4,500 ewes, are lambed, which would mean $4,500.

4. 270 tons of hay are produced, which, at $20 per ton, are worth $5,400.

5. 857 bushels of corn are harvested, and at $1.50 per bushel are worth $1,285.

6. The total of 1 to 5, inclusive, means a gross value of $23,105 from this improved range unit per year.

This represents an average gross per acre of $1.75. It is significant that over half of the total is produced by one-twelfth of the land. This emphasizes the relative value of bottom lands. The importance of uplands should not be overlooked, however. Having been treated for erosion in the worst places and being properly stocked, they are not only producing forage to complement that produced in the valleys but they also produce the water needed by the valleys. This water is of good quality and in governable amounts.

Some "before" and "after" figures are worth mentioning. Prior to 1939, Prewitt lambed 3,000 ewes for 1 month, grazed 2,000 ewes in the fall for 15 days, and grazed 200 cattle for 4 months during the summer, a total of 1,600 animal-unit months. In 1939 Prewitt and the Soil Conservation Service range specialist agreed that after the structural work had been completed and after the flooded areas had had opportunity to become established with good forage, the entire unit could probably safely sustain 2,800 animal-unit months' use. The present use being

made of the area, as indicated previously, is 4,258 animal-unit months. Thus, the grazing capacity has increased over two and one-half times in 5 years. This is 52 percent more than it was anticipated the area would carry following development. This is because of Prewitt's persistence in not only maintaining his floodwater irrigation system but also in improving it.

Prewitt states that formerly he could use only half of the "range" portion of this unit, due to poor distribution of water, but that since construction of stock tanks he can reach all portions. Further, he states that the over-all grazing capacity of the upland range has increased one-third because of reseeding of denuded areas, contour furrowing, small brush spreaders, and other practices.

I myself am familiar with the area, and viewed it recently. I noticed considerable unused grama grass even near stock-watering places. Quality and amount of grass, clover, and alfalfa in the bottoms have not reached the top; there continues to be steady improvement. Arroyos and gullies are slowly but surely healing over.

As evidence of good range and good management, is is pointed out that while this ranch has always raised good lambs (average, 74 pounds), it is now raising better ones. Average lamb weights at sale time in 1942 were 82 pounds. In 1943, the lambs averaged 81 pounds. Long yearlings, mixed steers, and heifers go off in the fall at the average of 720 pounds. Full credit for the increased weights, of course, can't be given to this one range unit, since sheep and cattle are on it only a portion of the year. The entire ranch, however, has been improved by tank construction and other measures.

Prewitt still does not feel that he has overinvested on improvements. He is now putting up sheep- and wolf-proof fences around his irrigated and semi-irrigated pasture and hay lands. He is putting in numerous small tanks to be filled from ditches throughout his bottom lands. Also, he continues to plant improved pasture mixtures, grasses, and legumes where there is evidence of need. Mr. and Mrs. Prewitt are shrewd business people, and there is no doubt about these investments paying dividends. There are a number of indexes to economic justification, but it will suffice to cite only one.

As has been said, the grazing capacity increased by 2,658 animal-unit months, or about 220 cattle, year-long basis. What would it have been necessary to pay for additional range to carry this number? It is very good range that will carry a cow year long to every 30 acres, and this type land east of the Rio Grande is now selling for around $5 an acre. At 30 acres to the cow and $5 per acre, it would take $33,000 to purchase enough to carry 220 cattle. The Prewitts, the Soil Conservation Service, and the Agricultural Adjustment Agency combined, haven't invested anything like this amount in developing the headquarters unit.

Space does not permit going into detail on many other interesting things about this ranch. Rather than omit them, however, here are some additional high lights: After seeing results on the headquarters unit, Prewitt put in water-spreading systems at

(*Continued on page 282*)

A farmer may tolerate a little of this in some seasons and in some types of woodland, and still not defeat his purpose of growing timber as a crop.

LIVESTOCK IN THE FARM WOODLAND

By JOHN F. PRESTON

For some years foresters of the Soil Conservation Service have consistently and stoutly maintained that livestock must not graze in the woods if a farm woodland enterprise is to be successful. This general premise may be considered the rubric of their faith. Long contact, however, with farmers and with other professional agricultural workers has tended to temper their attitude and caused them to re-examine their position in some detail under the light of the facts of farm economics.

It long has been recognized that grazing of cattle, horses, and sheep in the western coniferous forests, especially in ponderosa pine, when gauged by the available forage, was not inconsistent with forest production and that the result was a favorable factor in fire-prevention. This generalized truth does not necessarily hold for grazing in farm woodlands, chiefly because of the difficulty of controlling the density of stocking. Nevertheless, dual use of farm woodlands in the western coniferous forest types seems to be the premise of farm planners.

In the pinon-juniper type of the southwest, foresters acknowledge that livestock grazing has a much higher priority than forest productiton. The control of grazing in these types, not its elimination, is emphasized. In other words, controlled grazing is in line with forestry principles.

In the Coastal Plains of the South, livestock, mostly cattle and hogs, range at will. It is a practice so thoroughly established that it is difficult, if not impossible, to change it. Furthermore, the stocking is usually exceedingly light and there is actually very little appreciable damage to the coniferous forest that predominates. Where these conditions exist on farm woodlands, there is no reason to exclude domestic livestock.

On the fringe of the great eastern forest just before it gives way to the prairie in Oklahoma and Texas is a type of scrub hardwoods (largely farm woodlands) that admittedly produces very little saleable wood. Here the foresters are quite willing to classify such forest types as chiefly valuable for grazing, and therefore, more or less to write them off the books as far as farm forestry is concerned. In the adjacent shortleaf pine stands, the grazing of livestock is a well established practice and, with adjustment of density of stocking to available forage, foresters admit that dual use is practicable.

The progress of the work of the Soil Conservation Service led away from specialization, and hence foresters of early days became more and more identified with general problems of farm conservation as seen through the eyes of farm planners. This experience resulted in a more liberal attitude or perhaps a

Editor's Note.—The author is chief of the Forestry Division, Soil Conservation Service, Washington, D. C.

This is obviously overgrazed—should not be allowed to occur by any farmer who is trying to grow timber as a farm crop.

better appreciation of the importance of livestock to the farm economy. They became more conscious of the fact that on many farms the livelihood of the farm is intimately tied up with the welfare of the livestock and that, in fact, the latter is very often the sine que non of farm success.

Farm planners approach the farmer with a sympathetic attitude toward the problem of providing forage for livestock, and with very definite ideas in regard to the effect of grazing on the productiveness of the woodland. They attempt to "set up" the farm woodland enterprise alongside the livestock enterprise so that they are complementary rather than antagonistic. Foresters, trained as soil conservationists, agree that the essential principle is to have the farmer recognize the woodland as a farm enterprise and undertake its management so that it contributes most to farm economy. Livestock may be entirely excluded from the woodlands, there may be limited grazing or seasonal grazing at times when it will do the least damage to forest growth, or there may be dual use throughout the year. In some circumstances and in some forest types, which usually include the central and northeastern hardwoods and the planted shelterbelts of the Great Plains, conservationists insist that no compromise with principle is possible. If the farmer must use the woodland as a pasture, the development of a farm woodland enterprise is not possible. However, a compromise, not of principle but of geography, may be possible and is, in fact, often made. The farm conservation plan is determined by the farmer, assisted by the conservationist, largely after consideration of two factors: land capability classes and farm economy. The final decision may be that only part of the area now covered with forests will be the basis of a woodland enterprise. If exclusion of livestock is essential to success, a good stout fence to keep it out of this part of the woods will be a part of the plan.

Here are the expressions of policy generally applicable in the regions so far as they are expressed in handbooks or field memoranda or implied in statements of record. They are given from west to east.

Pacific Region.—In a territory so vast and with such widely varying conditions a simple statement of policy, uniformly applicable, is obviously impossible. In a handbook for Northern California, I find this recognition of the damage from grazing in farm woodlands: "Domestic livestock kill reproduction by browsing and trampling and may retard growth by compacting the soil."

Southwestern Region.—In the type of forests in this region, dual use is obviously the rule, rather than the exception.

Northern Great Plains Region.—The general policy is no grazing; again subject to modification locally in some coniferous types. "Grazed farm woodland is poor land use. Grazed woodlands produce neither good pastures nor good woods."

Western Gulf Region.—"The degree of grazing protection required for areas planned for woodland

or wildlife depends upon the plant species desired and the classes of livestock. All woodland and wildlife areas; including existing woodlands, plantations and natural reproduction areas, must be given a degree of grazing control which permits the establishment of reproduction, natural or planted, of the desired species and its continued growth to full usefulness for the purposes intended, and which maintains adequate ground cover for erosion control * * *. These policies apply only to fenced areas. Open range grazing has destroyed potentially high woodland and wildlife values throughout extensive areas. * * * but the only thing this Service can do to control open range grazing is to encourage cooperators to depend upon their own improved pastures and whenever possible fence the woods out of the open range."

Upper Mississippi Region.—No grazing in hardwoods. "Continual intensive grazing by domestic livestock in woodland is of even more damage to a hardwood forest than is an occasional fire."

Southeastern Region.—Coniferous forests predominate. "Provide for protection from damage by grazing. If fencing is necessary and the fence cannot be constructed immediately, the plan should provide for accomplishing this over a period of years consistent with the farmer's ability."

Northeastern Region.—No grazing in any farm woodland.

Actual performance is the best index to present policy. Here are examples from what I have seen, or read in the farm plans. In one case in California, a cooperator in a farm forestry project had built a fence through the middle of a small woodland of young Douglas fir. On one side of the fence, grazing of sheep was allowed, on the opposite side, no grazing. The farmer was to keep records and watch results. That was admittedly an experiment.

In the redwood region, a farm woodland management plan covering a big area of woods that is a part of a livestock farm provides that the cooperator will "protect the forest area from damage by domestic livestock." A variety of forest types are represented on this farm in the areas open to livestock grazing—hardwood, redwood, Douglas fir, chamise, scrub oak, and various combinations of these. Another example from the Sierras is ponderosa pine type—"field 14 will be used for pasture in the event the owner establishes a sheep enterprise. Except for occasional shade trees all the timber should be cut and utilized." It is here recognized that we must either have sheep pasture or woods, but not both. In setting up a woodland enterprise the possible usefulness of grazing as well as the potential damage in is worthy of study. Grazing can sometimes serve a useful silvicultural purpose. I was shown an excellent example of such use of livestock in Mississippi. On the farm forestry project a farmer took us along a fence line through a hardwood forest. On one side was a thrifty stand of young pine mixed with the hardwoods, on the other side almost pure and largely inferior hardwood. The explanation? Goats grazed where I saw the pine, eating the hardwoods but finding the pine seedlings less palatable. The farmer realized the danger of continued goat grazing and removed the animals in time to prevent their silvicultural operations from backfiring into destruction of all vegetation.

In east Texas, in a mixed hardwood-pine woodland a farm plan provides "fire should be kept out of the woods at all times and no grazing should be permitted." On the other hand, in Arkansas, under like forest conditions, I found cattle grazing in a 200-acre farm woodland apparently doing so little damage that no one suggested that it would be desirable to remove them. In Virginia the farm plan for a farm containing a similar forest type reads, "this area will be protected from fire and grazing." In Irwin County, Ga., a farm plan states, "The shortage of pasture * * * will be overcome by several areas of carpet and other native grasses in the farmer's woodland and on the adjoining range." The restrictions on grazing are getting tighter but the livestock are tolerated under some circumstances.

In North Dakota, in the Turtle Mountains, the forest type is largely poplar or "popple." In one instance only 40 acres in a 160-acre farm woods were fenced from livestock, although the entire 160 acres were included in the woodland management plan. It may be that controlled grazing here will answer best the problem of the farmer who wants to produce both livestock and wood products. In Idaho in the white pine, cedar, Douglas fir, larch and ponderosa pine types, controlled grazing seems to be the accepted practice. In Western Washington the Douglas fir type does not often contain much forage, but the farm planners say "grazing is not recommended" rather than, "grazing is not permitted." In the western hemlock type they say "no grazing." Here is the recommendation on the farm of Stewart Bush, a cooperator in the Cowlitz Farm Forestry project: "The need for additional pasture area is recognized as urgent. However, the slashing of areas which support excellent stands of young second growth fir just as they are becoming merchantable, such as fields 3, 10, and 23, would need to be done at a great sacrifice in the value which could be derived

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RANGE MANAGEMENT CONTRIBUTES TO WAR EFFORT

Good grasses are abundant on this winter range 6 weeks prior to normal growth period, assuring adequate forage for the cattle. The healthy growth of grasses on this range provides an adequate cover to conserve moisture for the production of forage during the ensuing year. Under such conditions, forbs appear seasonally to add further to the grazing value of this range.

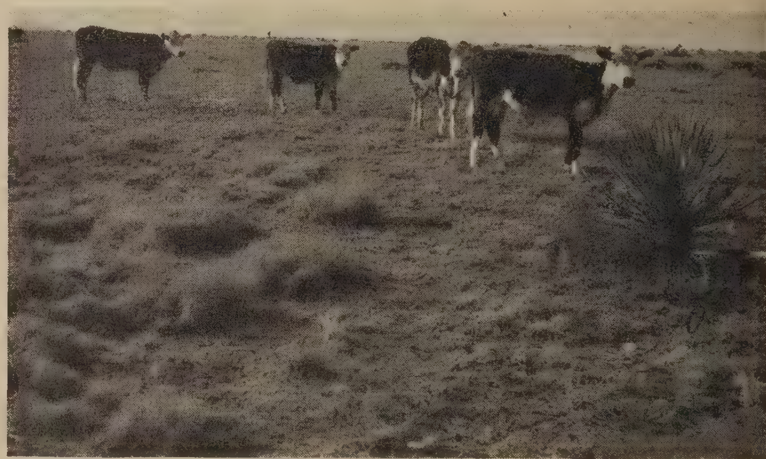
By KENNETH FIERO

If the ranges are to make their maximum contribution to the war effort, their management must necessarily be directed to maintaining in thrifty condition a high proportion of desirable forage species.

A rancher in Coke County, Tex., produced more pounds of lamb and wool from 200 sheep per section than was previously obtained from 250 sheep. The 200 ewes, grazed under a system of deferment and rotation, produced a lamb crop averaging 71 pounds, as contrasted to a lamb crop averaging 47 pounds from 250 ewes per section.

On a sheep and cattle ranch, in Presidio County, Tex., heavy stocking with lightweights resulted in a low lamb crop and a reduced total production of livestock products. It also caused a high death toll from "hollow belly," an ailment common on excessively grazed ranges, and started a downward trend in the range condition. The rancher reduced the number of animals by approximately 30 percent and now is being rewarded by higher yields, increased lamb crops (90 percent compared to 65 percent), and higher calf crops. The division of large pastures into several smaller pastures permits seasonal use, which asssists in arresting the downward trend in the condition of the range.

These examples emphasize the fact that the amount of feed harvested by livestock is an all-important factor in the maintenance of plant vigor. Plants must have adequate leaf surface and rest periods. Maintaining a vigorous growth of palatable plants is assurance that the livestock will receive the essential nutriments for maximum growth.



Only less desirable grasses remain a month prior to normal growth period. The more desirable gramas have been used excessively on this range, while three-awn, muhly, and burrograss have held little attraction to the grazing livestock. Under these conditions, the poor grasses are given every opportunity to displace the better grasses and forage production will be impaired each succeeding year unless the downward trend of the range is arrested.

Destruction of all top growth through excessive grazing is the initial step in range deterioration. Decadence is soon hurried along by the introduction of other factors which make it hard for the better forage plants to live. The invasion of the less desirable plants is an indicator of range decadence.

EDITOR'S NOTE.—The author is range conservationist, Soil Conservation Service, Fort Worth, Tex.

Among the grasses, three awn is probably the most widely distributed of such species, with muhly grass, burro grass, and fluff grass dominating local areas. These species contribute no signficant quantity of forage for livestock production, inasmuch as stock seldom grazes them when more desirable plants are available. Invading forbs and shrubby plants, in general, likewise are of little grazing value. Among these are the toxic plants that take large death tolls in livestock.

Replacement of the low quality plants with desirable species will provide better forage and will assist the conservation of soil and moisture. Management practices which permit desirable plants to carry on their essential physiological functions are prerequisits to the restoration and maintenance of desirable forage species and maximum sustained production of livestock.

While the intensity with which the individual species in the plant community are grazed is of utmost importance, the season of use also may have a very significant influence in the maintenance of ranges. The danger of too early spring use is well known. The amount of use in the fall may be equally important. Although it is generally thought that the perennial grasses are immune to damage during their period of dormancy, studies reveal that growth activity is in process throughout the year and that damage may be as extensive during the so-called dormancy stage as during the early stages of seasonal growth.

In the case of blue grama, fall may be a more critical period than spring, due to interference with the translocation of food to the roots and the setting of buds for growth during the ensuing year. This being the case, the importance of fall deferment is greatly magnified on the ranges in good or excellent condition. Such ranges rarely have an appreciable amount of reproduction from seedlings, and the seedlings rarely develop into mature plants. Blue grama tillers readily however; hence, management should be directed to encouraging this process. Ranges in fair or poor condition should have the advantage of longer rest periods to restore the productive capacity of the desirable forage species. In many instances, even moderate grazing should be delayed through the growing season and in the fall until danger of disrupting the physiological function is at a minimum.

Variable factors common to the range country present a difficult problem of adjusting livestock numbers to coincide with annual fluctuations in forage production. A system that appears to be a practical solution to this problem is being employed by a number of ranchers. The plan consists of adjusting the size of the breeding herd to the forage production anticipated during a year of low rainfall and to other factors which may contribute to below-average production. During years when a surplus of forage is produced, calves may be carried over to yearlings to utilize the forage. The marketing of dry stock and the culling of inferior stock are logical steps in making the initial adjustments.

Deferred grazing, or the delayed use of forage on portions of the range, provides a practicable system of increasing forage production. Buffalo grass will yield as much as 20 percent more forage when deferred from 6 to 8 weeks during the growth period. The additional feed resulting from this simple practice is a significant contribution to the war effort when converted to pounds of livestock and livestock products.

Buffalo grass, and other plants of similar growth habits, such as curly mesquite, respond most favorably to relatively short periods of deferment. Blue grama, side-oats grama, and the bluestems make their greatest contribution of forage when deferment is for a longer period.

Tobosa, three awn, and black grama have peculiarities unlike the plants mentioned previously. These plants are attractive to livestock, for short periods during the year. In mixtures with more palatable plants, these less preferred plants are not fully utilized. When they occur in appreciable quantities they may be isolated for use during the brief periods when they are most succulent. Otherwise, the plants with higher palatabilities may be grazed excessively while the less preferred plants are given opportunity to increase in the plant community.

Requisite to good range management is knowledge of the kind and amount of forage available, the seasonal development of the forage plants, and the time and intensity of harvest to which the plants can be subjected without depreciating the maximum yield of forage for livestock production. These are fundamental considerations in planning the use of the range lands in order that the ranges may yield their maximum sustained production for the war effort.

Undesirable grasses and shrubby plants supply 85 percent of the total forage cover. The displacement of the better grasses has reduced the forage production. The crusting of soil and a scanty cover of vegetation cuts down the effective use of moisture.

Data obtained on these plots and in the laboratory at the soil conservation experiment station, Bethany, Mo., were used to determine what happens to soils under different managements.

REBUILDING ERODED SOIL IS A SLOW PROCESS

By R. E. UHLAND

The rebuilding of severely eroded areas is an integral part of the soil conservation problem. Many soils have already lost a large part of their top soil, and their production has been seriously lowered. Appropriate steps should be taken to check erosion and restore production.

Experimental plots established on the soil conservation experiment stations at Temple, Tex., and Bethany, Mo., show that the productivity of poorly protected top soils is lost very rapidly by erosion. These experiments show, further, that once the humus-charged granular topsoil is removed the exposed subsoil usually absorbs water more slowly, loses more water as run-off, erodes more quickly, and produces poorer crops. Even with the best of management these exposed subsoils regain very slowly their organic matter and their ability to produce crops.

At Bethany, Mo., the organic matter content of the 0.7-inch layer of topsoil was 3.23 percent in 1930. With 13 years of continuous cropping to corn, the soil loss through erosion was 51 tons annually or 4.9 inches. The organic matter of the remaining topsoil decreased to 2.23 percent, representing a decline of 10 tons of organic matter in 13 years. Under a 3-year rotation of corn-wheat-hay, the soil loss was 7.2 tons annually, totaling 0.7 inch for the period. The organic matter remained unchanged at 3.23 percent.

Where alfalfa or grass occupied the land for 13 years, the soil loss for the entire period was less than 0.01 inch. The percent of organic matter for the alfalfa plot increased to 3.93 percent; and for the grass plot, to 3.61 percent. Thus, under alfalfa the organic matter in the 0–7-inch layer of soil increased 0.70 percent or 7.0 tons per acre; while under grass, the increase was 0.38 percent or 3.8 tons per acre.

A soil-renewal experiment was started at Bethany to see how rapidly the organic matter and the crop yields of the exposed subsoil of the Shelby silt loam might be increased. The cropping systems used, together with the treatments applied and the crop yields secured for the 11-year period 1932–42, are shown in table 1. The corn yields were especially low, because two of the three crops on plots 1, 2, and 3 were near failure because of drought and insects. In the case of plots 4, 5, and 6, one of the four corn crops failed because of drought and insects.

In 1942 corn was grown on all the soil-renewal plots to see how past treatments might be reflected in corn yields. Corn production, together with percent of organic matter and cumulative soil and water losses for the period 1932–42, are shown in table 2.

It will be noted that the corn yield for plot 2, which was the untreated subsoil, was slightly less than 48 percent of the yield of plot 1, the normal untreated topsoil. This was true for the average of the three crops as well as for the 1942 crop. Plot 3 was limed and cropped to the same 4-year rotation as plots 1 and 2 but received 200 pounds of superphosphate per acre on the oats, yielded 83 percent as much as the untreated topsoil for the 3 years and 84 percent for 1942.

Plot 5 was limed, superphosphate was applied before oats, and a 3-year rotation of corn-oats-sweet clover followed, with the sweet clover turned under in the spring before corn. With this treatment, the

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corn yield in 1942 amounted to 102.3 percent of the yield from the untreated surface soil cropped to a 4-year rotation. When manure at the rate of 8 tons per acre was applied before turning under the sweet clover for corn the yield was raised to 64.6 bushels or 150.2 percent of the yield for the untreated surface. On plot 7 which was limed and fertilized and seeded to a grass legume mixture which occupied the land for 10 years the corn yield was 44.2 bushels, or 102.3 percent of the yield for the surface soil that was not treated.

The freshly exposed subsoil at Bethany contained 1.71 percent of organic matter in 1930. Where it was clean fallowed for 13 years the average annual run-off measured 8.7 inches and the soil loss 56.5 tons or 5.5 inches for the period. The organic matter during this period decreased to 1.41 percent, a loss of 0.3 percent or 3 tons of organic matter per acre.

Where a 4-year rotation of corn-oats and 2 years of hay was used on plot 2, the loss on the untreated subsoil was 1.2 inches for the period, but the percent of organic matter in the top 7 inches increased to 1.93, a gain of 0.22 percent, or slightly more than 2 tons per acre. By applying lime and fertilizer to the exposed subsoil (plot 7), seeding a grass legume mixture, and allowing all the crop growth to remain on the plot, the soil loss was but 0.007 inch per acre for the 11-year period. The percent of organic matter was raised to 2.16 percent, representing a gain of 0.45 percent or 4.5 tons per acre.

These findings show that under a 4-year rotation (plot 1) on the normal surface soil of the moderately eroded Shelby silt loam the organic matter was lowered during an 11-year period from 3.02 percent to 2.84 percent. In another experiment, 13 years of continuous cropping of the surface soil to corn decreased the organic matter to the extent of 1 percent, or the equivalent of 10 tons per acre. On an adjacent plot cropped to a 3-year rotation the organic matter was maintained at 3.23 percent for a 13-year period.

If we assume that these rates of change in organic matter on these desurfaced soils will continue, it will require but 66 years of cropping to a 4-year rotation of corn-oats and 2 years of hay to build the organic matter up to the level contained in the topsoil as it was tested in 1930. By liming and fertilizing and seeding to a grass legume mixture (plot 7) and allowing all crop material to fall back on the desurfaced soil, the organic matter equivalent to that contained in the original topsoil could be attained in a little less than 30 years.

Exposed subsoils, however, are usually more difficult to cultivate, allow more run-off, have less plant food, and make less effective the rainfall with which to make a crop. Unless erosion and run-off are controlled, much of the plant food applied as fertilizer may be lost. It should be pointed out that the cultural operations on these soil-renewal plots were carefully performed and the run-off and soil losses were held to a minimum. Under field conditions plowing of severely eroded lands or exposed subsoils average much shallower, and the run-off and soil losses are much greater.

Obviously, the rates of change in organic matter

Table 1.—*Crop yields on soil renewal plots at Bethany, Mo., for 11-year period 1932–42*

Plot No.	Cropping system	Treatment	Crop yield per acre		
			Corn	Oats	Hay
			Bushels	*Bushels*	*Tons*
[1] 1	C–O–Cl. & T–Cl. & T	None	14. 6	16. 3	1. 03
2	C–O–Cl. & T–Cl. & T	None	7. 5	3. 9	. 46
3	C–O–Cl. & T–Cl. & T	L+P	12. 1	16. 6	. 95
4	C–O–Cl. & T	L+P	17. 4	20. 6	. 80
5	C–O–Sweet Clover	L+P	22. 9	23. 5	S. Cl. under
6	C–O–Sweet Clover	L+P+M	29. 1	28. 0	S. Cl. under
7	Grass and Legume mixed	L+P	[2] Only 1 crop	No harvest	No harvest

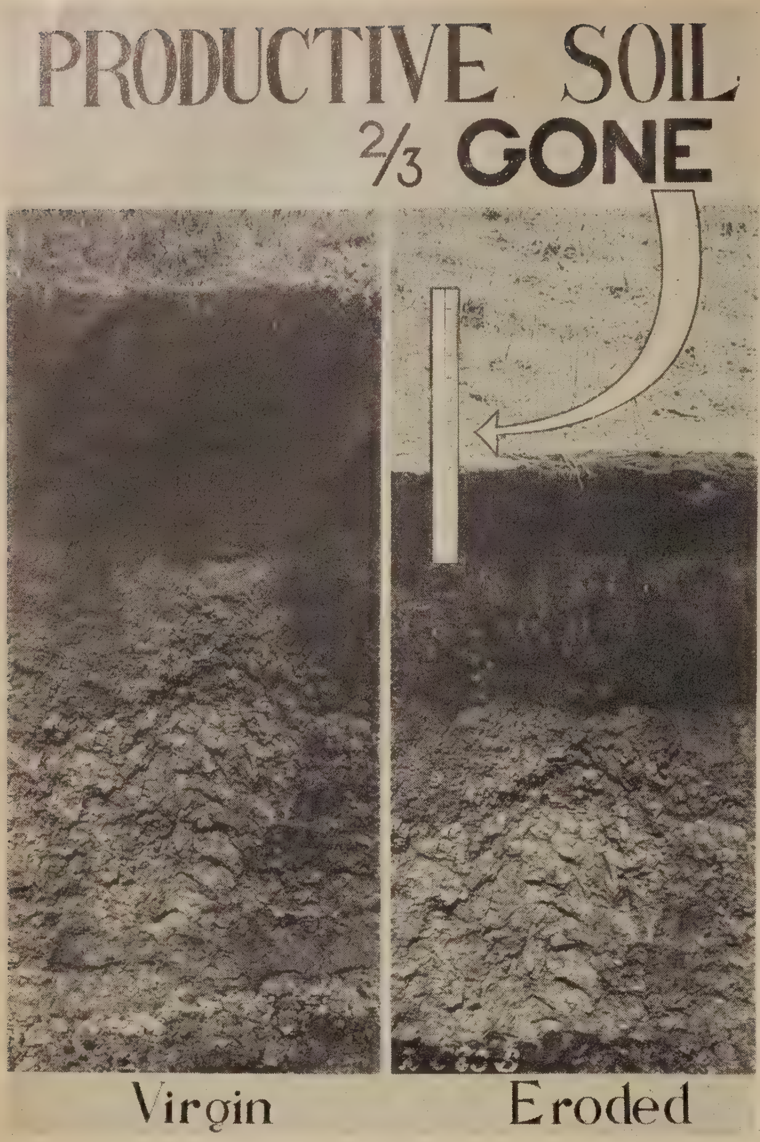
[1] All plots desurfaced (exposed subsoil) except Number 1, moderately eroded surface soil.
[2] Plot 7 remained in grass and legume mixture for period 1932–41, when it was spaded and put in corn along with all the other plots.

C—corn; Cl—clover; L—lime; O—oats; P—phosphate; T—timothy; M—manure—8 tons/acre before corn; S. C—sweet clover.

Table 2.—*Data on soil renewal plots at Bethany, Mo. (See Table 1 for cropping systems and soil treatments)*

Plot No.	Corn yield 1942	Organic matter 1943	Soil loss 1932–42	Water loss 1932–42 [1]	Plot No.	Corn yield 1942	Organic matter 1943	Soil loss 1932–42	Water loss 1932–42 [1]
	Bushels/acre	*Percent*	*Inches*	*Inches*		*Bushels/acre*	*Percent*	*Inches*	*Inches*
1	43	[2] 2. 84	0. 83	42. 9	5	44. 0	2. 00	. 72	33. 0
2	20. 5	1. 93	1. 22	48. 4	6	64. 6	2. 26	. 62	34. 1
3	34. 6	1. 96	. 53	29. 7	7	44. 2	2. 16	. 007	12. 1
4	32. 2	1. 89	. 76	39. 6					

[1] The total rainfall for the period 1932–42 was 324.5 inches, an average of 29.5 inches per year.
[2] The normal surface soil in 1932 contained 3.02 percent organic matter and the freshly exposed subsoil contained 1.71 percent organic matter.



recorded for the desurfaced plots are greater than would occur under normal field conditions.

Most investigators have found that cultivated soils accumulate organic matter at a much slower rate as the organic matter increases. In other words, we would expect it to take a great deal more time and be more difficult to increase the organic content of a soil at a given location from 2.5 percent to 3.5 percent than to increase it from 1.5 percent to 2.5 percent. It might be noted also that (plot 1) the normal surface soil contained 3.02 percent organic matter in 1932 but without treatment declined to 2.84 percent, a loss of 0.18 percent, or 1.8 tons per acre in 11 years. These observations would indicate that the accumulation of organic matter in these soil-renewal plots will become increasingly slower, and the time required to bring the organic matter above 3 percent (that found in the topsoil in 1932) will be greater than indicated above. There is a question as to whether it can ever be raised to this point while cropped to cultivated crops. If left in grass and legumes, as in plot 7, it is possible that in time the organic matter would be restored.

At Temple, after 10 years of cropping to cane, Sudan, and oats and the growing and turning under of a green manure crop each year on the Marly C horizon of the Austin clay, the organic matter was 1.37 percent. Where grass occupied the untreated subsoil for the entire period, the organic matter had increased to 1.60 percent. The organic content of the originally exposed subsoil is not known and we cannot, therefore, tell what change occurred on the cropped plot. If, however, we assume that the organic matter was evenly maintained on the cropped plot, it was increased the equivalent of 0.23 percent under grass. This represents a gain of 2.3 tons of organic matter in 10 years.

The original Austin topsoil contained 2.8 percent organic matter, 1.43 percent more than the exposed subsoil. At this rate of increase it would require a little more than 62 years of grass to bring the organic matter of the subsoil up to that contained in the topsoil. This Marly subsoil consists of about 68 to 75 percent calcium carbonate, and the results show that these soils do not respond sufficiently to commercial fertilizers to pay for the extra cost. Good response, however, is obtained from legumes, green manure crops, and barnyard manure. Legumes commonly used for soil building do not, however, do well on this soil because of root rot, and manure is scarce. The building of organic matter and nitrogen in these exposed subsoils is, therefore, a very slow process.

At Temple the corn yield for 1943 for the nondesurfaced Austin clay was 27.6 bushels per acre, while that for the desurfaced soil, representing the Marly C horizon, was but 16.4 bushels. Thus, after this desurfaced plot had been cropped to row crops for the period 1932–43 with a green manure crop that was turned under each year, the corn yield was but 59.4 percent as great as from the nondesurfaced plot where no green manure crops were grown or turned under.

Color tests were made of the soils from a number of the plots at both Bethany and Temple. It was found that there were some changes in color values; where the organic matter had increased appreciably the color was darker. This was not necessarily always true. The color value for the freshly exposed subsoil at Temple was 7.0, while that for the exposed subsoil on which grass had been growing for 10 years was 6.8. The topsoil of the Austin clay showed a color value of 5.5. It should be added that the higher the number, the lighter the color of the soil.

After 13 years of alfalfa at Bethany, the color value was 3.4 and the percent of organic matter was 3.93, compared with a color value of 3.2 and organic matter content of 3.61 percent after 13 years of grass.

The desurfaced soil cropped to a 4-year rotation for 12 years without treatment had a color value of 4.2, with 1.93 percent organic matter. Where a grass and legume mixture occupied the desurfaced soil for 12 years, the color value was 4.1, with 2.16 percent organic matter. The hue and the Chromatic values changed very slightly for the soils at both Bethany and Temple.

The data from these two widely separated locations show that the organic matter of badly eroded soils was increased and the yields improved, but the rate of increase was very slow and may be expected to be slower as the level of organic matter increases. In order to increase the organic matter appreciably in badly eroded soils, a cropping system must be used which controls erosion and a large portion of the vegetative growth must also be returned to the soil. By adding barnyard manure, along with fertilizer and lime, the soil was improved more rapidly than without treatment. Observations showed that crop production on the exposed subsoil plots, as well as on severely eroded plots or fields, was affected more seriously by dry weather than was the normal surface soil. The findings indicate that in order to increase appreciably the organic matter in badly eroded soils it is necessary to supply needed fertilizers and maintain them in noncultivated crops most of the time.

RESULTS "ASTOUNDING"

On March 22 Chairman Tarver, of the Subcommittee on Agricultural Appropriations, made the following statement in Committee of the Whole:

"The Soil Conservation Service, in my judgment, is performing a more useful service for agriculture than any other organization of the Department of Agriculture.

"I have had the opportunity to examine its work in connection with soil conservation districts set up in my own State, to which, as to other districts throughout the country, it furnishes technical assistance and assistance in the making of farm plans and otherwise. The result of its work, to one who will take the trouble to examine it, is astounding. It has contributed not only to the restoration of the soil where it has been depleted, but it has contributed, in substantial ways, to the material prosperity of the farmers who have undertaken to cooperate with the Soil Conservation Service in this work, and I feel amply justified in the statement I made a few moments ago to the effect that the Soil Conservation Service is performing a work of more benefit to agriculture than is any other organization in the Department of Agriculture."

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from these same areas by practicing forestry until they are ready for clear cutting. It is believed that additional pasture areas can be supplied from areas which are ready for clear cutting by seeding immediately after the burn and grazing during the period required for the area to reseed to trees."

In Ohio and Michigan in the maple-oak woods and generally throughout the hardwood forests of the east, "fires and livestock must be kept out of the woods at all times." For an Indiana farm woods (hardwoods), "all grazing must be prohibited and fires prevented if a productive woodland is to be the result." Yet sometimes some concessions have to be made to livestock even in the hardwood and the hardwood-coniferous types. For example, one farm plan prescribing management rules for a 60-acre hardwood-pine woodland contains this statement: "To achieve these results, the owner must continue to protect the woodland from fire, and must never let more cattle range the woods than he is allowing at the present time."

In some cases controlled grazing may be the best farm practice even though some damage to the woods is recognized. The damage done by grazing animals are matters of intensity and season. We should not be too dogmatic. It is a farm problem that must be solved for each farm on consideration of the type of forest, kind of domestic animals, and intensity and season of grazing.

In view of the tremendously varying conditions throughout the United States, the difficulty of defining a national policy is apparent. Here is the statement proposed for insertion in the Soil Conservation Service Manual:

> The grazing of domestic animals in woodlands, with the exception of regulated open range grazing in some coniferous forests, is recognized as injurious to timber growth, and therefore the efforts of the Soil Conservation Service will be directed toward preventing that damage. Ranging of hogs in longleaf pine forests and in shelter-belts and windbreaks in the Great Plains is recognized as very injurious, but in other types moderate use by hogs may not be objectionable. With the above exceptions, exclusion of domestic animals from the woodlands is the safest rule and unless accomplished, the volume of forest crops will certainly be seriously reduced.

Foresters are neither weakening their attitude nor making great sacrifices in the essential rules of forest practice. Rather, they are becoming more tolerant due to a better appreciation of the reality of the facts of farm economy. Farm forestry problems cannot be solved independently of other farm enterprises. Good farm forestry consists of those practices in the woodlands which in the long run contribute most to farm economy.

MAKING A BURNED RANGE WORK FOR VICTORY

By August 1941 sheet and gully erosion were taking a heavy toll of soil from the burned range.

By IRVIN D. NICHOLAS and RULON C. BERGESON

Each year many thousands of acres of rangeland in the semiarid sagebrush and grass country of south-central Idaho are accidentally burned. Forage capable of feeding thousands of livestock is destroyed, sometimes permanently. The immediate loss to the war effort is in the form of meat products and wool which the animals normally grazing on these rangelands would produce. This story tells how a large tract of range, after the vegetation had been completely wiped out by a destructive fire, was restored to productive use.

On June 19, 1940, the hottest day ever recorded in Boise, a tract of about 7,500 acres of south-central Idaho semiarid rangeland was blasted by a roaring and explosive fire that started from an undetermined origin near the railroad water-stop of Orchard, some 20 miles southeast of Boise, in the Mayfield Soil Conservation District.

All of the sagebrush and virtually all of the grasses were destroyed by the intense heat of the fire. All seed and the entire surface organic matter were consumed. Rodents, insects, worms, and probably even bacterial life in the surface soil ceased to exist over the entire burned area. The blackened and seared range lay inert and lifeless for many months afterward.

These barren grazing lands, which prior to the fire had been covered by a mantle of sagebrush with a sparse understory of grasses and weeds, soon were subjected to serious soil drifting. Often during the fall of 1940 and the spring of 1941 the atmosphere was so heavily laden with dust that motorists traveling U. S. Highway No. 30, which passes along the northern boundary of the burn, were forced to turn on their lights, even on bright, sunny days. During late fall and winter rains caused heavy sheet and rill erosion over nearly the entire area, in spite of the fact that it is comparatively flat.

In the fall of 1941 the area was still bare of vegetation. Investigations revealed certain climatic and other factors which tended to make successful reseeding difficult: (1) The annual rainfall averages about 10 inches, with only 20 percent falling during the growing period; (2) no effective rainfall may be expected during July, August, and September; (3) the soil for the most part is Chilcott silt loam, a true desert type, highly calcareous, with caliche lime formations near the surface which render the soil impervious to the deep penetration of moisture; (4) normally heavy spring winds contribute to the droughtiness of the surface soil at seeding depth, even though the soil 2 or 3 inches below the surface

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may contain sufficient moisture for plant growth; (5) the presence of rodent colonies in the nearby unburned area would necesitate carrying on a rodent control program around the boundaries of the burn to prevent damage to new seedlings; and (6) even though the burned area in its virgin state had supported a stand of nutritious bunchgrasses and browse, these had disappeared because of previous heavy grazing use and the fire, except for a few isolated areas that contained only small remnants of the original cover.

Though these conditions were recognized as difficult for the survival of grass seedlings, even in the most favorable years and with the best planting methods, seeding of the area to grasses seemed to be the only feasible means of hastening recovery of forage production. Accordingly, the supervisors of the Mayfield Soil Conservation District and Carl E. Nicholson, a Mayfield district rancher who runs approximately 10,000 head of sheep and who has used the area for many years, decided to initiate a seeding program. With the assistance of Soil Conservation Service technicians, they agreed upon a plan for seeding about 3,000 acres, of which 1,500 were to be planted in the fall of 1941. Equipment consisted of three 10-foot drills with double disks, fluted feed and 6-inch spacings, which were pulled as a gang behind a 40 horsepower crawler-type tractor. The drilling operations were started October 24, 1941. Because of bad weather, breakage, and other interruptions, only 1,300 acres were seeded by December 3, 1941, when freezing weather occurred and drilling was stopped.

The seed mixture consisted of 2½ pounds of crested wheatgrass, 2½ pounds of bulbous bluegrass, and 1 pound of biennial sweetclover per acre. Plants of the earlier seeding began to come up before the last of the drilling was finished. Winter rye was seeded in half of one drill, forming a 5-foot strip as a wind erosion control measure.

The results of the seeding in the spring of 1942 were exceptionally good. The rows of tiny new forage plants looked like a wheat field in its early lush growth. It remained to be seen, however, what the plant survival and plant vigor would be after the new plants were subjected to summer heat, drying winds, and rodents. No seeding of grass on desert rangelands in southern Idaho had been undertaken before on so large a scale. The significance of a successful seeding was recognized by everyone, because of the magnitude of the range area that is burned each year, the number of people affected more or less directly by this destructive orchard fire, and the increased forage that such seedings, if successful, could produce for use by livestock.

The area was not grazed during 1942. This was to allow the new seedling grass plants to become firmly established.

The seeded area was first grazed in the spring of 1943, from April 15 to April 30, by 850 ewes and 1,250 lambs. Mr. Nicholson estimated there was five times as much feed on the planted area as it had ever produced before. When his Basque sheepherder was asked, "How good is the grass?" he answered:

"Good, good grass; sheep they spread out, fill up, lay down. Have trouble—sheep he no want to go back into brush." (The "brush" referred to is the surrounding unburned sagebrush.)

On an actual use basis for the first year it was grazed, the area furnished 1 animal unit month of grazing for each 6 acres. This compares with 60 acres of burned range and 12 acres of the adjacent unburned sagebrush range for each animal unit month. At the end of the first year, the seeding had reached only about one-half of the eventual grazing capacity expected when the seedling grasses have fully developed.

The natural reestablishment of a vegetal cover on the *unseeded* portion of the burn has been exceedingly slow. It is estimated that in 10 years recovery may be sufficient to permit 1 animal unit month of grazing for each 20 acres.

Does seeding pay? That the seeding was profitable is borne out by a summary of the cost and conservatively estimated returns. Total cost of the seeding operation, including seed, rodent control, fuel, labor, and machinery depreciation, was $0.89 per acre. Incidentally, this was offset by AAA payments to Mr. Nicholson of $0.825 per acre for range improvement and rodent control.

The comparative values of the seeded and the unseeded areas of burned range have been estimated to be as follows:

Item of annual cost	Unseeded (per acre per year)	Seeded (per acre per year) [2]
Taxes	$0.05	$0.05
Interest on investment 4 percent on $2	.08	.08
Interest on seeding costs $0.89		.03
Annual cost per acre per year	.13	.16
Estimated average annual value of available grazing [1]	.01	.20
Annual returns	(loss) .12	(gain) .04

[1] Value is based on $0.60 per animal unit month, customarily used by farmers in the area in normal times. Wartime values would be much higher.
[2] Beginning with second year of grazing.

The unseeded, burned rangeland is a distinct liability. It will cost the rancher $1.20 per acre to own

it for 10 years, while the seeded range is a very tangible asset. Although there would be a loss of $0.06 per acre the first year of grazing due to the necessity of protecting the new growth from full use, there would be a gain of $0.04 per acre during each of the succeeding 9 years, and a return of $0.30 per acre during the 10-year period of rehabilitation.

It is conservatively estimated that at the end of 10 years, the seeded portion of the burn, if not improperly grazed, will show an average grazing capacity of 2½ to 3 acres per animal unit month. On a 2½ acre basis, a gross return of $0.24 per acre, with a cost of $0.16 per acre, would be realized. This would leave an annual profit of $0.08 per acre.

Range management practices that give protection while the stand is being established, and which provide for moderate grazing thereafter, must be a part of any successful reseeding program. Control of rabbits and other rodents also must be included in the program of range reclamation where such animals are numerous enough to endanger new seedlings.

Whether the newly seeded stands will retain their vigor of growth under grazing, or decline under the severe growing conditions that typify a semiarid climate, remains to be seen.

The results obtained to date, however, indicate that establishment of forage grasses by seeding burned areas in the intermountain semiarid rangelands under conditions similar to those existing on the burned area described here is both feasible and practicable.

RANGE CONSERVATION PAYS DIVIDENDS

(*Continued from page 270*)

three other places on his range. Forty of these irrigated acres produced 480 sacks of beans, which helped keep sheep herders and cowhands in "chuck." Twenty-five head of fattened and slaughtered hogs meant lard and bacon for the same purpose. The 8 acres of garden kept the ranch in fresh vegetables all summer, and the cellar will store "root" crops for winter use. In cooperation with the New Mexico Game Department, elk and wild turkey were released on the uppermost irrigated area. The reservoir has been stocked with bass and bream. No one encouraged the Prewitts to do these things. They are progressive ranchers and conservationists in their own right.

There are many ranchers in the West who are not taking full advantage of opportunities to improve their present holdings. With no open range or new frontiers to move to, and with ranches for sale at high prices, it would pay to investigate the possibility of spreading floodwaters on bottom lands. While the practice involves a number of considerations, there are two of primary importance: (1) Assurance with respect to water rights under State law and (2) appreciation of the fact that water spreading is like any other type of irrigation. It isn't self-operating—it requires careful operation and maintenance.

One-half of every third drill row was planted to rye. This puts up a barrier against the wind, encourages retention of snow moisture, affords winter protection for new plants. This is how the seeded portions looked by August 1942.

Small ditches have produced high yields of muskrats.

FURS FROM FARM LANDS

By PHILIP F. ALLAN

Part II

ARTIFICIAL DENS FOR FUR BEARERS

On any kind of land there may be so few natural dens that artificial ones must be provided if the desired animals are to be encouraged. These should be well scattered and preferably not more than one-fourth mile from water. They should be put in places where they will not interfere with other activities or be a fire hazard, as, for example, brush piled near public roads. If they are farther away from water they are usually little used by the common fur bearers although they may be used by cottontails.

Relatively permanent suitable dens may be provided as a part of ordinary farm or ranch operations by piling unwanted materials, such as rocks, stumps, or brush, in otherwise unused parts of the farm. The profit from opossums, skunks, raccoons, and minks often will repay the trouble of hauling to a suitable site.

Opossums and raccoons readily use nest boxes built on the style of bird houses. These are made of slabs, rough boards, hollow logs, or small kegs, and are securely fastened well up in trees along streams or hedges. An inside dimension of 12 by 12 by 36 inches is desirable, and a 5- to 8-inch entrance hole is needed. A tight-fitting roof completes the nest box.

Artificial underground dens of old culvert pipe or tile have proved attractive to striped and spotted skunks, weasels, minks, opossums, raccoons, and cottontails. The pipes or tiles are buried at least 10 inches deep in a well-drained site, or so place that they provide dry dens. When tiles are used, an old milk can buried at the end of the excavation serves as a nesting place. Large rocks placed at the entrance so as to leave a 6-inch hole will prevent dogs from digging around the den.

In the long run, improvement of the habitat is more satisfactory and less expensive than constructing artificial dens, but the farmer or farm boy with plenty of time and materials will undoubtedly find it interesting and worth while to construct such dens.

PROTECTING BURROWING ANIMALS

Burrowing animals are undesirable in crop fields and meadows or other places, where they seriously compete with or damage farm and ranch crops. On wildlife lands and woodlands and in many pastures they do little or no harm. Their control on these lands is seldom economical, and their protection means more dens for fur bearers. A chain of events usually provides a den for a large animal—a fox, for example. The burrow of a shrew, perhaps following that of an insect, may be enlarged by a cottontail. A woodchuck, then, may adapt it for its own purposes, and later a skunk or opossum. At last a fox reworks the burrow for his own home. Woodpeckers and squirrels may well be responsible for many raccoon dens.

HOW TO HARVEST FUR BEARERS SAFELY

The principal problem of managing fur bearers is that of taking the greatest number without damage to the breeding population. In order to do this it is necessary to have some idea as to the numbers pres-

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A mink.

ent, but since accurate census methods are relatively unknown even to wildlife managers, the use of general indicators must suffice. Trappers should watch closely the abundance of fur bearers before the trapping season and should notice changes in the habitats. Droughts or floods destroy many animals, even though, by concentrating them in limited areas, they may make the animals seem abundant.

Muskrat

The muskrat responds to good management of marshes, ponds, streams, and ditches more readily than do any of the other fur bearers. It also furnishes us with many clues to its abundance.

Houses and dens.—The number of "active" houses—that is, those which show signs of internal use—may serve as a rough indicator of muskrat abundance. Such records as are available show an average of more than 1 muskrat per house—for practical purposes, 2; in good years, 5 or more per house. Roughly, the more houses within a given area the greater the yield per house. Under conditions of low water and dense vegetation, however, a small number of muskrats may build a great many houses and, hence, mislead the trapper into thinking muskrats are abundant. A good habitat sometimes has as many as 10 houses per acre, but the unimproved coastal marshes average about 3.

Where conditions are suitable, muskrats dig burrows, which they seem to prefer to houses. The trapper may find burrows by locating the under-water runways leading into them. Burrows appear to harbor larger numbers of muskrats than do houses. The presence of droppings in the vicinity of burrows indicates their occupancy. Under ordinary conditions about three muskrats per burrow may safely be taken.

Condition of food plants.—When muskrats become abundant they may graze the food plants heavily for 30 to 40 feet about their houses or burrows. This is generally considered an indication of the need to trap many muskrats, particularly if the grazed areas about several houses or dens meet.

Evidence of fighting.—Fighting between muskrats often results from high population. This may be due to some especially favorable condition in an otherwise normal habitat. When this is true, they may be trapped heavily. On the other hand, it may be that an unfavorable habitat condition has concentrated all the muskrats in a small area, and it may be inadvisable to trap at all.

Population changes.—Muskrat numbers are said to increase and decrease periodically, with peaks every 9 to 11 years. Whether the changes are periodic or not, there are changes during wet and dry years. Observation over a number of years may indicate increasing populations, which may then be heavily trapped. Drought or floods may reduce their numbers or may cause the muskrats to move overland. If the movements occur during the trapping season the animals may as well be trapped, for similar habitats are likely to be fully occupied or in a flooded or droughty condition, and mortality of migrating muskrats is usually high.

Safe harvests.—Muskrats usually produce one to four litters a year, depending on locality and other factors. In the North litters are fewer than in the South. Mortality of the young is high, but generally enough survive to permit profitable harvests. In years of small numbers 60 to 70 per cent of the entire population at the time of trapping probably can safely be taken. In good years it is safe to take 70 to 80 percent.

The proportion of males and females in the catch is an indicator of when to terminate spring trapping. When females outnumber males in the daily catch for several consecutive days toward the end of the season, experienced trappers believe that enough muskrats have been taken. Some stop trapping at the point when females constitute one-third of the total season's catch. As an all-around rule of thumb, traps should be pulled when the catch begins to fall off, unless the decline is due only to a few days of unfavorable weather.

Opossum

The improvement of habitats for the opossum will largely be a byproduct of improvements for other fur bearers or of the management of stream banks, hedges, and woodlands.

Dens.—Watching for dens throughout the year,

or tracking the animals to them when possible, may give a clue to abundance of burrows, rock crevices, culverts, and hollow trees which serve as den sites for opossums. In excellent habitat, one out of every four suitable dens may be occupied by opossums.

Safe harvests.—From the little evidence available it is apparently safe to take one-half to three-fourths of the opossums annually. Not more than one-half is recommended for northern areas. A single report of sustained yield in Mississippi indicated that a 66-per cent harvest did not adversely affect the breeding population.

Skunk

As with most farm fur bearers, skunks reach their maximum abundance near streams, ponds, sloughs, and ditches, although they are not confined to such areas.

Dens.—Some studies of skunk dens revealed that about 1 out of every 5 dens is occupied. In one study, one-third of all known dens had skunk occupants. Winter populations of occupied dens average 2 skunks, but it is not unusual for a den to contain 10 to 12. A harmful practice in many localities is the opening of dens and killing the skunks inside. Usually in dens containing many skunks, females predominate. The destruction of these may depopulate a large area for a year or more; moreover, the den, as a result of digging, will be uninhabitable.

Population changes.—Skunk populations fluctuate greatly, although there is little evidence of regularity. According to trapping records, they decline or increase in adjoining States at the same time. For example, from 1935 to 1938 skunks were apparently abundant in Michigan, Illinois, Wisconsin, Minnesota, and Iowa but decreased throughout those States in 1939 and 1940. Trapping should be reduced during times of low numbers.

Raccoon

Raccoons are usually most numerous within one-fourth to one-half mile of a watercourse, lake, swamp, or marsh, although occasionally they may be abundant in dry woods.

Dens.—A single family of raccoons may use several dens, some of which may be tree dens and others rock crevices, culverts, or other ground dens. In good habitat an average population is about two 'coons per occupied tree den.

Safe harvests.—An average of slightly more than one raccoon per den in good habitat apparently can be safely taken. At the western and northern limits of raccoon range one-half the fall population can be trapped, elsewhere it is safe to take two-thirds.

Mink

Considerable care is required with mink, for, of all the fur bearers, they are the easiest to overtrap.

Mink show a marked preference for brushy streams, although they are abundant in marshy areas. In one study, four times as many mink were found in brushy areas as in marshy ones. They seldom wander more than 30 feet from the stream but are believed to travel long distances along watercourses.

Dens.—A single mink uses a number of dens within its territory.

Safe harvests.—Perhaps one-half of the mink can be safely harvested. A sustained-yield record, however, showed two-thirds. If the number of occupied dens is known, a safe rule of thumb for harvest may be one mink per three or four dens.

DAMAGE FROM FUR BEARERS

The farm fur bearers sometimes damage poultry, crops, or earth structures. On the other hand, skunks are valued by many farmers for their destruction of white grubs, weevils, and other insects, as well as rodents. Minks and raccoons likewise eat many of these pests. Killing the animal that is doing the damage often is all that is necessary.

Good care of poultry, including housing in a well-built poultry house, not only prevents harm from skunks, opossums, raccoons, and minks but also from rats. Whenever it is practical to do so, poultry houses and yards should be located at some distance,

A raccoon.

preferably at least an eighth of a mile, from bodies of water. Lanes of cover, such as tall grass, weeds, or brush, should not join poultry houses and yards with stream banks or other fur-bearer habitat. If shade is desired for poultry, trees rather than shrubs should be used.

Removal by shooting or trapping is the only effective way of preventing muskrats and raccoons from damaging corn. Muskrat damage to corn ordinarily is greatest within 50 feet of water. Since a muskrat pelt generally sells for as much as a bushel of corn, the damage need not represent a total loss. A border of persimmon trees around an orchard might minimize damage to fruit by opossums.

A solid core or a layer of sand or gravel a foot deep on the face of an earth structure will prevent most damage from burrowing muskrats. Wire netting and piling are sometimes effective.

OTHER FUR BEARERS

Although weasel fur is sixth in volume production of wild furs it is unlikely that many farmers would make any effort to increase it. The pelts are generally low in value. Brush, stump, and stone piles near grassy cover are attractive to weasels. In orchard, meadow, or crop field, weasels may be distinctly beneficial because they feed on rodents.

Red, gray, and swift fox furs are collectively seventh in volume production of wild furs. Foxes, like weasels, often are unwanted on farms. The gray and swift foxes bring lower prices than the red. The foxes usually hold their own unless heavily trapped or hunted.

Generally farmers and ranchers cannot legally take beaver, although the beaver is increasing on agricultural land in many places. To the landowner, the greatest value of the beaver comes from its water-holding dams. They may be useful in creating conditions suitable for muskrats and minks. Beaver should not be stocked near irrigated land or orchards.

Badger pelts are always in considerable demand; but aside from protection, no management measures directed toward the increase of badgers are known. Badgers are one of the principal enemies of mice and ground squirrels.

In areas where sheep and poultry are not raised extensively the coyote is valued locally as a fur bearer, and its destruction by methods which prevent utilization of its pelt rob us of this source of fur. At present the pelts bring high enough price to warrant careful consideration of the methods used in killing coyotes.

Squirrel pelts usually are a byproduct of hunting for sport and food, but many of them are sold for fur. The greatest single contribution that can be made to the management of squirrels is protecting woodlands from livestock.

The pelts of wood chucks, whistlers, and rock chucks are of little value, but the animals themselves are generally considered valuable to other fur bearers because their dens are used to a large extent by skunks, opossums, foxes, weasels, and badgers—and the woodchucks themselves are eaten by several of these.

Cottontails are generally considered game rather than fur-bearing animals, although some pelts are taken. As providers of dens for skunks, cottontails are important. Their most important value to fur bearers, however, is as food. At present the uses for jack rabbits are few, and no one is likely to try to increase their number despite the fact that pelts have brought 18 to 35 cents recently. There is a considerable demand for the carcasses to provide food for fur-farm animals and dogs.

HANDLING AND CARE OF PELTS

Any reputable local fur buyer or raw-fur purchasing company will supply information on how to skin fur bearers and handle the pelts so as to bring highest returns. Such information is available through many State conservation departments or State colleges. Well-prepared pelts mean more money. Since a large proportion of wild-produced furs are average in size and quality, one should not be misled by price quotations on "extra large" or "extra fine" skins. Measured unstretched from the nose to the base of the tail (muskrat, opossum) or end of tail bone (skunk, raccoon, mink), pelts which are within an inch or two of the following measurements can be considered of average size: Muskrat, 11½ inches; opossum, 18 inches; spotted skunk, 20 inches; striped skunk, 24 inches; raccoon, 30 inches; and mink, 24 inches.

Furs vary in price from year to year and from place to place. Northern and eastern furs generally sell for more than southern and western ones. During the period 1900–1935 the average prices per pelt were as follows: Muskrat, 97 cents; opossum 24 cents; striped skunk, $1.38; spotted skunk, 45 cents; raccoon, $1.75; mink, $2.26. During the war period 1914–18 furs brought very high prices, and during the present war they are again rising.

Merchants of Conway, S. C., have shown their interest in the work of the new Horry Soil Conservation District by purchasing 5 books on soil conservation and having 5,500 handbills on pastures printed and distributed through the district, Ernest Carnes, South Carolina state conservationist, reports.

REFERENCE LIST ☆☆

Compiled by William L. Robey, Printing & Distribution Unit

SCS personnel should submit requests on Form SCS–37 in accordance with the instructions on the reverse side of the form. Others should address the office of issue.

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Secretary Claude R. Wickard and Lorenzo R. Patino meet to discuss Mexico's agricultural needs. Mr. Patino is Chief of the Department of Conservation in our neighbor Republic to the south. His department is a bureau of the National Irrigation Commission.

Soil conservation work is being projected in five states in Central Mexico. Surveys and practices adhere closely to those which are proving so successful in the United States.

Mr. Patino, who arrived in this country in March, will be with the Soil Conservation Service until July 1 studying the war-motivated conservation-production work in the South.

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